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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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VOL. CXXXVII., No. 2799.] TUESDAY, JANUARY 2, 1917. [69TH YEAR.

EDITORIAL NOTES.

The New Year and Essential Work.

MOMENTOUS as have been the last two-and-a-half years, more momentous still will be the year over the threshold of which we have just passed; and every individual and industry —in fact, everything that goes to make up our complex national constitution—will have, in the next few months, to incur much greater sacrifices than anything that has hitherto been experienced during the war. We are as a nation face to face with new conditions and new developments. There is a new Government, with, in its composition and at the head of departments, practical and experienced men of business. The work of the nation and of the war is now being conducted upon business lines, with an organization directed to achieving the maximum efficiency in the conduct of the war and in ministering to the essential needs of the nation. It is realized that there is an inseparable union between the two aims, and, further, that everything that is not essential must succumb to the attainment of the maximum result in everything that is. The Government are going to take control of coal mining and shipping. Coal is essential to all work that is important in the war and to the nation; and shipping is essential to the maintenance of our Armies and to the provision of the nation's necessaries at as low cost as possible. Labour, too, is all-important; and so are our agriculture and food problems. To most of these, special departments have been allocated by the new Government, with at their heads (as we have said) men of practical experience, and men in whom the country has confidence. In addition to the new and permanent department having charge of the affairs of labour, the country welcomes the appointment of a Director-General of National Service, and has approved the selection of Mr. Neville Chamberlain, who is an outstanding figure in the industrial world, despite innate disinclination to personal prominence. His special work, for which he has recognized qualification, is to be directed to the mobilization of our man power, and to assign it to the reinforcement of our Armies, and to the essential industries (those contributing to the supply of munitions, agriculture, mining, and shipbuilding), as well as to the subsidiary and auxiliary manufactures—in short, to all that are vital to the maintenance of the country, and its power and efficiency in the war.

The gas industry, which is largely interested in all this, is highly essential to the country and in the war; and it is working accordingly. It has nevertheless been threatened with a further sifting of its men in the spring, when every undertaking will have to show whether or not it has got to the bedrock in parting with men who are not essential, or who cannot be replaced by women workers, by men above military age, or by men who have been injured in the war, but are still capable of other work. While admittedly there are distinctions as between gas undertakings in what has been done in this direction, taking the industry as a whole its efficiency in its manufacturing and commercial work has been considerably impaired by the extent to which it has given up skilled and trained hands. It has cheerfully borne this; but it will be the duty of the authorities to see that there is no further deprivation of man power if this will trench on ability to maintain the large contributions of the industry to the ever-pressing needs of the war and to the requirements of industries and the people, to the convenience and health of the latter, and to the provision of a rich fertilizer for food-production purposes. There is nothing of a luxury about the productions of the gas industry. All are highly essential, and at this time more so than ever. There should be no difficulty in making those—being business men—who will be looking into these matters see the position of the industry in its true light. But the industry cannot ask for preferential treatment beyond what is necessary to maintain its operations on the present scale. What has therefore to be done, now and without delay, by every chief officer of a gas undertaking is to see that he has all possible resources organized, in view of any emergency. We have each one to think and act nationally, and not selfishly, and see where, if anywhere, our ideas and practices can be revised, so as to contribute to the maximum extent to the present essential work of the country. The next few months will confront us with many radical changes, and possibly with great events. It behoves each one (as the National Gas Council has intimated) to be prepared, and not to underestimate the possibilities. Among the "great "events," everyone in the industry will hope there may be included the complete downfall of our ruthless enemies. That is what our country and her Allies are working for. Let the object be kept well in the forefront of our thoughts and actions in promoting our maximum contribution to its consummation.

Gas Legislation for 1917.

HALF the Gas Bills that have been lodged for promotion in the next session of Parliament are reviewed in other columns this week; and the other half will be surveyed in a succeeding article. The total number of Bills is only eight; and there are two Provisional Orders which help to maintain the continuity of such productions. But small as is the number of measures, they are interesting in that they reflect certain current needs and developments. By their own doing—whether wholly necessary or otherwise is not the present question—the Government have altogether upset the basis upon which commercial concerns have hitherto been financing themselves; and this particularly refers to statutory undertakings with limited powers of charge and regulated dividends. As was the case last session, the Bills now before us give substantial indication of the new influences in financing, and of the need for statutory undertakings legislating to meet them. The Sheffield Gas Company (this is to be the new shortened title of the Company when their Bill is entered on the Statute Book) directly call attention to the disability under which labour even large, long-established, and financially strong concerns when they point out that they are now unable to issue the balance (£105,000) of debenture stock authorized in 1893, because of the limitation of the maximum rate of interest to 4 per cent. They, with various other companies, are proposing to ask for powers to issue redeemable preference and debenture stock on the terms allowed last year; but the Lea Bridge and the Hemel Hempsted Gas Companies propose that the provisions of the Statutory Companies (Redeemable Stock) Act, 1915, shall be extended and applied to them. We wish these Companies every success, as, if they secure the power sought, they will be authorized thereby to form a redemption fund from revenue, which was denied to the gas companies who had redeemable powers conferred upon them last session, but had to be content with redemption by funds provided by the issue of stock or shares on better terms than can in present circumstances be obtained, or by the exchange of the redeemable stock or shares for other stock or shares. As a matter of fact, a clause in the Newcastle Act of last session specifically excluded the Company from the provisions of the Statutory Companies (Redeemable Stock) Act.

In other ways, the more onerous terms on which capital

can to-day be raised by trading companies is emphasized by the Bills. There is the desire on the part of the Sheffield and Lea Bridge Companies to be freed from the limit of dividend on preference stock or shares, and to have liberty in fixing the rate per annum. Again, the Haslemere Company are asking for borrowing powers to the amount of one-half the capital raised. The Ascot Company secured this privilege in 1915; but though the Newcastle and Aberdare Companies in their Bills as lodged asked for similar sanction last session, it did not appear in their Acts. Incidentally, it may be noted that the Sheffield Company are suggesting the formation of a sinking fund by appropriating out of revenue a sum not exceeding 1d. per 1000 c.ft. of the gas supplied during a year, with the total not at any time greater than the amount of the additional capital, including the loan capital, issued under the powers of the present measure. The sinking fund is to be applied to capital purposes; and any dividends or interest arising from it is to be placed to revenue. It will be interesting to see the lines of the argument to be advanced by the Company in this connection.

The South Staffordshire Mond Gas Company are also acutely feeling the effects of the war and more; and it is abundantly clear from the Bill which they are promoting that in their original powers there was not enough working latitude. They were prohibited from issuing share capital below par, and cannot in consequence now raise fresh capital—and this, quite apart from the war, owing to the thin dividends which they have paid on the ordinary share capital, and which they have had to go without during the war years, but in which a dividend of 6 p.ct. has been paid on the newly-issued preference capital. The prices the Company are allowed to charge consumers are 3d. per 1000 c.ft. for quantities of not less than 4 million c.ft. per quarter, and 4d. below. It is plain that these prices have been, in the circumstances of Time's developments, close to cost. It is true the Company have the power of appeal to the Board of Trade for a revision of their prices; but it appears equally true that the Board of Trade are limited in the considerations to which they may give attention in adjudicating upon an application for a revision. This fact, combined with the dividends paid, is sufficient evidence that originally margin enough was not allowed for contingencies and variations of market conditions. In considering an increase of price, the Board of Trade have, under the Company's existing Act, to be satisfied that the price of good quality slack exceeds 6s. per ton delivered. If it does, they may authorize an increase of $\frac{1}{8}$d. per 1000 c.ft. for every 1s. by which the price of slack per ton exceeds 6s. But many more things than "slack" required in such a business as gas making and supply (even when confined to the industrial side) have increased materially in cost; and it is impossible to go on with such limitations as are imposed by the former Act. As, too, sulphate of ammonia plays such an important part in the revenue of the Company, time may witness another significant change in conditions. However that may be, the Company now propose to raise the prices of 3d. and 4d. to 5$\frac{1}{2}$d. and 6$\frac{1}{2}$d. respectively. This only shows how quickly estimates made under certain conditions and on certain hypotheses may go far astray with changes and unfulfilled expectations. In conjunction with this change, the Company seek borrowing powers to the extent of £205,000, to be issued irrespective of the amount of capital actually raised by the issue of stock or shares. This indicates that, unless there is a large expansion of the business on the higher gas prices, the holders of ordinary share capital must not place their anticipations too high. Fuller particulars on these matters will be found when the Bill is reviewed next week.

Regarded from the general aspect of the relation of gas prices to dividends, another particularly interesting feature (but the interest is discounted so far as the promoters themselves are concerned) is found in the Sheffield Company's scheme of dividends and charges for gas. The Company evidently do not believe in the sliding-scale as ordinarily practised; and so a range of fixed dividends is set out in the Bill, governed by the charges for gas when these do not exceed certain figures. What we mean by the "interest" being "discounted" as applied to Sheffield is that, with the Company charging such low general prices as fortunately exist in Sheffield, the exercise of the provision, at the figures named, is only likely to be a very remote contingency; and thus it may be accepted that the new "A," "B," and "C" stocks into which it is proposed to convert the old 10 p.ct. ones are to all intents and purposes at once, and with every prospect of permanence, 5 p.ct. stocks. The "A" stock is to receive a fixed 5 p.ct. dividend; the "B" stock 4 p.ct., so long as the general charge per 1000 c.ft. shall exceed 3s. 6d., and 5 p.ct. so long as it does not exceed 3s. 6d.; and the new "C" stock and additional capital, 3$\frac{1}{2}$ p.ct. so long as the general charge exceeds 3s. 3d., 3$\frac{3}{4}$ p.ct. so long as the price exceeds 3s. and is not more than 3s. 3d, 4$\frac{1}{2}$ p.ct. so long as it exceeds 2s. 9d. and is not above 3s.; and 5 p.ct. below 2s. 9d. Nobody can picture a condition of things arising when the Sheffield Company will even approach these prices as general charges.

There is a growing tendency now for gas companies going to Parliament to provide for annual meetings only, and the payment of interim dividends without the sanction of a general meeting. The Gas Light and Coke Company and other gas companies are this session seeking authority in this direction. Several companies are taking power to appoint a managing director; while the Lea Bridge Company desire authorization to elect as a director, when occasion serves, a retiring chief engineer, general manager, or secretary—only one at a time to hold directorial office—and to increase the fees of the Board in proportion. There are companies desirous (as in previous recent sessions) of getting authorization to purchase crude and partially purified gas; and the Sheffield Company have in contemplation a coke-oven gas and power-gas scheme. All which is in the direction of the promotion of fuel economy. A differential prices clause is much favoured in these times. Variously the promoters adopt or do not do so the one-third residuals purchasing restriction. We think it the duty of every promoting gas undertaking to protest against the unjust imposition by omitting it from their Bills whatever ultimately happens. Mostly the old minimum pressure of 8-10ths appears; but the Kenilworth Gas Company specify 1 inch. The calorific value standard naturally has a showing.

These points indicate some of the outstanding features of the Gas Bills—apart from general capital, works, and other normal clauses—which will have consideration during the forthcoming parliamentary session.

Coal Carbonizers and Manufacturing Developments.

IT is not our custom to run down our own country. Its achievements have been great; and they have worked wonderfully well to the benefit of humanity, and to the prosperity of the nation. But it cannot be disputed that, in some respects, we stand convicted of being a slow-moving people, of missing our opportunities, and of not fully realizing our possibilities, or, when they have been realized, of not grasping and making the best use of them. The gas industry is one that has not taken full advantage of its manufacturing opportunities; and the coking industry is another. The gas industry has largely forgotten, or did not until lately realize, that its expansion should proceed along two roads; and it has been content to seek development along one of them—that is, the utilization of gas. In manufacture, it has hitherto been satisfied with producing gas, coke, tar, and ammoniacal liquor and sulphate of ammonia. It has year in year out kept to these manufacturing limits, except in the case of certain large undertakings. That (with these exceptions) it should extend its operations beyond the limits never crossed the minds of the bulk of its professional men. They preferred to allow development to proceed in the most uneconomical manner—by transferring their products to (in some cases) great distances to be dealt with by others. Devolution of this kind is not, in this particular instance so economical as concentration (given a sufficiency of material) by treatment at the source of production, or by co-operation close to that source. The same applies to the coking industry. It has been content to produce metallurgical coke, tar, sulphate of ammonia, and benzol; but in most cases the owners of the coking plants have never aspired to go beyond into tar distillation and sulphuric acid making, or have sought to make better use of their gas than at present.

The coking industry was indicted on the count of inappreciation of possibilities, by Prof. L. T. O'Shea, M.Sc., at a recent meeting of the Midland Section of the Coke-Oven Managers' Association; and there can be no genuine refutation of the charge. But for the gas and the coking industries partial excuse can be made. They have both grown from somewhat crude beginnings; and, in the case of the gas industry, the tar distillation and chemical industries

that have fastened themselves upon, and fattened by it, have likewise grown from small beginnings. Their works served as the collecting centres for the bye-products other than coke of the numerous gas-works (which were all small once) scattered about the country. Co-operation had not then attained such a position as a principle in industrial development as it has to-day, or the administrators of the small gas works of the past might have seen that, by joint enterprise, they could have done much that at all events the tar distillers were and are doing—thus making one less industry drawing between producer and user considerable profits from the derivatives of the distillation process. There is another reason—and this supplies a most important part of Prof. O'Shea's paper—for the limit set and adhered to in both industries; and it is that the technical officers of the industries were not qualified to undertake their development upon chemical lines. They were engineers and managers; generally speaking, they were not chemists. But they have closer association with chemistry to-day, and will in future be, if the coming men are trained to fit their work, what Prof. O'Shea says that they should be—chemical engineers. This development of the men means positive development of the industries. Development begins with brains, and brains must be competent to initiate. An engineer who is not a chemist, but with a chemist at his elbow who is not an engineer, is not the same competent man for the development of an essentially based chemical industry as the man who is classed as a chemical engineer.

The war has brought much enlightenment on this matter. There will be no going back. We have seen potentiality in the gas industry; we have descried deficiency. Had we already developed tar distillation and sulphuric acid making on a large scale, we could have been of more prompt use to the country in the making of explosives and to the dye industry; and there would not have been the same amount of trouble over sulphuric acid. We can be our own sulphuric acid makers, our own tar distillers, producers of benzol, and engage in the distillation of wash-oil, either singly or by co-operation—in fact, much else presents itself in the way of development. The coking industry can develop in regard to tar distillation and sulphuric acid making, and in respect of a better utilization of its gas—not only in the direction of employing it in large power stations and in the generation of electricity for works purposes, but in supplying it to the gas industry for sale, as at Middlesbrough and Leeds. In the past session or two of Parliament, gas undertakings have secured authorization to purchase crude or partially purified gas; others wish to do the same thing in the coming session. Preparation is thus being made for a larger collaboration between the two industries—assisting to a greater extent in the conservation of the nation's coal supply. In the ways set out by Prof. O'Shea and in others, the material position of the two industries can be developed, as well as their resources. The greater the resources, the greater the scope for development.

Fogs and Reduced Lighting.

LONDON had one of its old-time fogs last Wednesday. It was of the variety the density of which became more pronounced as the day advanced. By the regulations under the Defence of the Realm Act, blinds must now be drawn at five p.m.; and no errant rays of light must be seen by the alert ordinary or special constable. But the authors of the lighting regulations had not taken account of Nature's own particular light obliteration scheme, nor of the dangers of darkened streets becoming intensified owing to fog, and had not therefore made provision for these things. Day was turned into night on Wednesday; and as the lighting regulations do not apply to meteorological capriciousness of this kind, the shopkeepers gave the public during the morning and afternoon a taste of pre-war times by having their windows lighted to the full capacity of unscreened means of illumination. The goods in drapery, millinery, jewellery, and other shops were inspected as though there was something novel in the but latterly unwonted spectacle of commodities looking at their best, as many do under the rays of artificial illumination. But five o'clock came along; and, the average shopkeeper being punctilious in his observance of the rules of authority, pulled down his blinds, and the to outsiders pleasant and helpful light was no more. The streets became more and more depressing. People jostled against one another; and the uncertainties of the streets increased, and would have been worse had not many of the drivers of conveyances usually found in the streets after dark given up the attempt to thread their way through the prevailing opacity. Boy scouts were to be seen helping wayfarers by the aid of lanterns; the electric hand torch was also in frequent evidence. But one longed for the friendly light of the shop windows or of the street-lamps that have not had their lanterns or globes obscured. In some districts, the shopkeepers did render service in the face of the rule of authority, and kept their windows unscreened. They were public benefactors. Now that a fog has been experienced the like of which may not (we hope not) occur again this winter, the police authorities have intimated that, during a dense fog in the London district, a more reasonable light from shop windows will be permissible. It is a pity they did not think of this before. And what about the street-lamps which are extinguished, and are not obscured? Why should they not, for safety's sake, be lighted in times of dense fogs? We see no possible reason so far as gas-lamps are concerned.

Prof. Armstrong's Exaggeration.

In his recent Nottingham lecture, Prof. H. E. Armstrong indulged in some scathing criticism of the local electricity supply policy. It is nothing new for the Professor to allow his tongue to run loose over matters of which he has had little or no practical experience. He has bombed the gas industry time after time with harmless frothy vituperation; but the technical men of the industry who live daily in its work, with all its multifarious circumstances, smile and take it all in good part. The men of the electrical industry will no doubt get accustomed to the same thing. So far as Nottingham is concerned, he accuses the Corporation with not doing their best to provide at a cheap rate electrical power for the borough's industries, and with being (as we understand him) prodigal in the matter of fuel. He learns that various firms in the town are, because of this, providing their own power plant, which is not a proceeding that is peculiar to Nottingham. But "Meteor" of the "Electrical Times" charges the Professor with gross exaggeration. While the Nottingham record is not an exemplar, it is not so bad as is painted. Our journalistic friend compares Nottingham's records with those of eight other concerns (which are not among the worst to be found) having about an equal annual output. The figures disclose that in coal expenditure per unit Nottingham is one of the lowest among the undertakings cited; in the number of units sold per head of the population, there are two lower (Belfast and Islington); while there are three worse in respect of load factor. "Meteor" hopes that Nottingham is "plotting" for improved plant; but, at the same time, he suggests that Prof. Armstrong "owes it to his reputation to be a trifle more careful." Which reputation? Why only a "trifle"? Since the Professor has had low-temperature carbonization on the brain, some of his statements have had a very distant relationship with carefulness.

Employers and Eligible Men.

It should be noted that an amendment has been made of the Defence of the Realm Regulation which requires the posting-up of lists of male employees of military age, and provides for the keeping of a record of such men who have not been employed for more than one week. By this amendment, further duties are cast upon employers, through the insertion of a paragraph to the effect that those who are required to make the list, or who keep the record, "must deliver forthwith to the Recruiting Officer a true copy of the list and record, and thereafter during the first week in every calendar month must deliver to him a written report showing any alterations and additions to the list and record as on the last day of the preceding calendar month." The forms in use for posting the lists in accordance with the regulation may be employed for making the copy of the list now referred to. Every person who in Great Britain takes into his employment any man who has reached the age of 18 and has not attained the age of 42, in any establishment where munitions work as defined by the Munitions of War (Amendment) Act, 1916, is carried on, must, within twenty-four hours after the man is taken into employment, deliver in writing to the Recruiting Officer for the locality in which the employer's premises are situated certain particulars which are set forth in the regulation. Every man who is taken into employment by any establishment to which the regulation

applies must furnish to his employer when required such information as may be necessary to enable him to deliver these particulars. The competent naval or military authority, or anyone authorized by him, may enter the premises of anyone from whom information as to employees is required, either under the regulation already referred to or under the Munitions of War Acts, and take such steps as may be necessary to test the accuracy of the returns made. For non-compliance with the obligations here indicated, there may be very substantial penalties inflicted upon conviction.

Fertilizers and Food Production.

On all hands, wherever the Government or other plans for enlarging the home production of food are discussed, the use of artificial fertilizers to intensify crop yields is put forward as indispensable. The producers of sulphate of ammonia must do their utmost to encourage such advocacy; no doubt the Sulphate of Ammonia Association are doing so. But individual producers should do their supplementary local part, as this campaign undoubtedly means much to the future of their produce. The compulsory use of artificial fertilizers has been raised several times of late; but, of course, however right it may be in these times to have compulsory fertilizing, the removal of the farmer's option in the matter of use ought to have attached to it some form of alternative. Mr. P. Trentham Maw, in a letter in the "Daily Telegraph," suggests one. He refers to the District Committees that are to be set up to carry out the Government proposals, and advocates very wide powers of action. One of these is that there should be insistence on a very extended use of artificial manures. Each District Committee, he thinks, should have power to allot to each farmer within its area a specified amount of manure according to arable acreage; and the farmer should have the option of purchasing and using it. In the event of the farmer declining it, Mr. Maw suggests that the Committee should be empowered to take over any fields, and the farmer be compelled to cultivate, manure, and crop such land before cultivating any of the rest of his farm if so directed; and he should be paid merely for rent and cultivation. In other words, the nation should take the risk if manures are compulsorily applied; and the farmer who may be unwilling to take a risk must be compelled to carry out the work at a fair remuneration, to be determined by the Committee. Apart from considerations as to the sufficiency of foodstuffs, the interest of the producers of sulphate of ammonia is to get as large a quantity of it as possible consumed at home. It does not matter much to the industry whether the farmer or the nation pays for the sulphate, so long as a fair market price is paid. But what it does especially hope for is that the sulphate of ammonia will be scientifically applied, so that the results will cause farmers to permanently make use of the home produce.

PERSONAL.

Mr. Thomas Milne.

Mr. THOMAS MILNE, who has been in the service of the Gas Light and Coke Company for a number of years, retired, as from the 31st ult., from the Company's Residuals Sales Department; and we hope that he has before him a long period of good health in which to enjoy his well-earned leisure. The Directors have appointed as Mr. Milne's successor Mr. J. H. OLLIVER, who has been in the Residual Sales Department for over twenty years. Mr. Milne has spent practically the whole of his business life with the Company; for, after making acquaintance with one or two of the various departments, he settled down just twenty years ago in their City office, having to do with the sale of products. During this time, he had, of course, a good deal to do with the old Sulphate of Ammonia Committee. He always kept the fact before him that it would be a splendid thing if the Sulphate of Ammonia Committee could develop into an Association having command, not only of propaganda, but also of sales; so that a firm front might be shown to the rapidly-growing German sulphate industry. In looking back at what has been done, Mr. Milne can reflect with pleasure upon the fact that his persistence in the matter for a good many years was at last so far crowned by success that at a meeting held in October, 1913, delegates from Belgium, France, the United States, and Germany were brought together to confer with the producers in this country. As a result of that meeting, the present Association was formed; the Chairman being Mr. D. Milne Watson, in whose capable hands the affairs of the Association now rest.

Mr. J. A. RANSOME having resigned his position as Managing-Director of the Richmond Gas Stove and Meter Company, Mr. J. W. SLACK, who is at the present time the Secretary and a Director of the Company, has been appointed as his successor. Mr. ARTHUR SLACK, who has been Assistant Secretary, will be the new Secretary.

Mr. W. J. LIBERTY, Public Lighting Inspector to the Corporation of the City of London (who joined-up at the outbreak of war, and served under various commands in different parts of the country, being rated up to Chief Petty Officer, and afterwards served under Lord Fisher at the Board of Inventions and Research, and Rear-Admiral Vaughan Lee at the Admiralty), has now been promoted to Commission Rank as Sub.-Lieut. R.N.V.R., and attached for duty in the Operations Division, under Rear-Admiral Stuart Nicholson, C.B., M.V.O., of the Flag Ship H.M.S. "Wallington."

Mr. IAN A. MACKENZIE, of the 11th Manchester Regiment, who is in a South London hospital suffering from shrapnel wounds in the arm and thigh, and from the effects of shell shock, is the elder son of Mr. Andrew Mackenzie, the senior representative of Messrs. Alder and Mackay. He was at one time assistant to Mr. F. D. Richmond, Manager of the Heckmondwike Gas-Works, and was afterwards himself Manager of the Whitwell Gas-Works. When he enlisted, his Directors retained his position for him, releasing him temporarily. Happily, he is progressing well, and will, it is hoped, be very shortly fit for the front again. Mr. Mackenzie's younger son Donald is also in the army, and, after serving in France, went some months ago to Salonica.

OBITUARY.

Mr. HERBERT B. RHODES, Chief Clerk in the Leeds Corporation Gas Department, was recently knocked down by a tramcar near his home, and died the following day. He was 52 years of age, and had occupied the post of Chief Clerk for the past eight years, having been in the Corporation service for nearly forty years.

Mr. J. T. PIPER, who died last Tuesday, had been associated with the Hastings and St. Leonards Gas Company for nearly sixty years, having risen from the position of a clerk to that of Accountant, which post he held until comparatively recently, when ill-health compelled him to give up. He is said locally to have been regarded as an expert upon all matters of finance. At the time of his death, he had reached the age of 72 years.

The death occurred, on the 27th ult., at Weston-super-Mare, at the age of 62, of Mrs. Annie Innes Steele, wife of Mr. R. O. PATERSON, who was for many years Engineer and Manager to the Cheltenham Gas Company. The death, on the same day, is announced of Mrs. Harriett Coke Winstanley, wife of Mr. GEORGE WINSTANLEY, of Crackley Hall, Kenilworth, and formerly Engineer of the Coventry Corporation Gas-Works. Mrs. Winstanley was 68 years of age.

Mr. H. BILSON BLANDY, who died at Wokingham last Wednesday, in his 89th year, was very well known in public and private life at Reading; having been for over forty years a member of the Town Council, and Mayor during four years. For 52 years he was a Director of the Reading Gas Company, and was Deputy-Chairman from the year 1886. On completing fifty years as a member of the Board, his photograph was hung in the Board-room. In 1904, Mr. and Mrs. Blandy celebrated their "Golden Wedding."

The death took place last Wednesday, at the age of 84, of Mr. SAMUEL DAWES, a former Manager of the Clevedon Gas-Works, which position he took up more than fifty years ago. As a matter of fact, he was the first Manager of the Company when it was originally formed. He was also for many years Manager and Secretary of the Yatton Gas Company, and only relinquished this position on account of enfeebled health. Some years ago, owing to the same cause, he received a superannuation allowance from the Clevedon Gas Company, in acknowledgment of his lengthy services.

The funeral of the late Mr. J. L. CHAPMAN took place last Saturday week, at Pinner Cemetery, preceded by a service, which was choral, at St. Anselm's Church, Hatch End. The coffin was borne on the shoulders of employees from the gas-works; and at the cemetery a large number of other employees lined the pathway. Mr. A. F. Phillips, J.P. (the Chairman), represented the Directors of the Harrow and Stanmore Gas Company; and Messrs. C. Chambers, W. Cady, W. J. Herman, F. Wheeler, and F. Owen, the staff. Besides the chief mourners were noticed Messrs. A. E. Broadberry and E. J. K. Fussell (representing the Tottenham District Light, Heat, and Power Company), Harold Foster, Corbett W. Woodall, Cyril G. Davis, H. A. & A. Longbotham, C. P. Sinclair (the Secretary and General Manager of the Colne Valley Water Company), T. W. Lennard, and others.

Calorific Standard Applications.—The Board of Trade have received applications for Provisional Orders fixing a calorific power standard of 500 B.Th.U., from the Bordon and District Gas Company, the Clevedon Gas Company, and the Woking District Gas Company.

ELECTRICITY SUPPLY MEMORANDA.

REVIEW OF THE PAST YEAR.

THE history of the electricity industry during the past year, as it has been affected by the war, is much on the same lines as that of the gas industry. Each within its own limits has been rendering yeoman service in connection with the provision of munitions of war; but the limits do not happen to be coterminous, owing to the gas industry being in the position not only to provide light and power to munition factories, but heat through its gaseous and coke fuels, and (with the coke-oven industry) the requisites for the making of explosives and other necessaries. It is believed that in their inmost souls electricians, through the war, hold the gas industry in greater respect than before (though envy may overflow); for through the war there has been poignant disclosure of the polygenous character of the gas industry's productions. They see the virtue of (for a single industry) the multiplicity of commodities; for the fact has penetrated the cloud-enveloped minds of certain electrical folk that an industry so established is not one that can be extinguished with the rapidity that was once foolishly contemplated as possible. It is also realized by electricians that the thanks of the Allied nations are due to the British gas industry for having saved them from being trampled under the iron heel of Prussian militarism; for the preparedness of Germany and the unpreparedness of the Allies in the matter of high explosives needed very drastic and persevering work on the part of the gas industry.

This work the guns in Flanders, Belgium, Russia, Italy, in the Balkans, and on the high seas testify has been well done. There are signs of the envy of the electrical industry. With the splendid pretence of assisting in the fuel-economy scheme, there has been a considerable amount of talk as to the lines of development with the view of eliminating from that industry the charge of being squanderers in its methods of utilizing fuel; and the reformation which appeals mostly is in the direction of gasifying coal and recovering bye-products.

SUGGESTED NEW ECONOMIC FOUNDATIONS.

The electrical industry has, in short, convicted itself of having constructed its operations on anything but sound economic foundations. There has been a large amount of discussion during the year as to "setting in order" the industry's "house." It is admitted that there is a good deal to be done in this way. There has been a revival of the talk of large concentrations of generating plant at pit-heads, in conjunction with coal carbonizing and secondary product recovery plant. But it has dawned upon the minds of some that such large generating establishments will fail in their economic purpose if there are not considerable and ample supplies of condensing water immediately available. The professional men of the industry have also been discussing the merits of low-temperature carbonization, and have shown *inter alia* that they do not know much about it. The Brighton Corporation Electricity Department were anxious to assist the Coalite Company to do something or other—possibly float another company—by putting down one of their plants at Brighton, supplemented by Mond producer gas plant in which the coke would be used, with ammonia recovery—the resulting gas being delivered to the Electricity Department for steam-raising purposes. But something has intervened (we think it was uncertainty and a little uncomfortable feeling on the part of members of the Corporation); and so the agreement, to the best of our knowledge and belief, has not yet been signed and sealed—no doubt much to the annoyance of the Coalite people. Then the Barnsley Fuel Company—a Coalite offshoot—have entered into an agreement with the Yorkshire Electric Power Company for the supply of gas to them—we suppose also for use under boilers, as most electrical engineers have an antipathy to engines that are driven by gas, notwithstanding that Mr. F. D. Marshall showed an astonished electrical world that he could "knock spots" off steam-turbine generation by utilizing in engines the gas produced by the low-temperature system of carbonization mixed with the yield from the gasification of coke in producers, with ammonia recovery. He predicted by his fruitful system the bulk production of electrical energy at 0·062d. per unit. But the doubting electrical Thomases are not encouraging to one who desires to show them the path to complete victory over all competitors. However, Mr. Marshall's good offices are threatened with eclipse by the project of an American mining engineer, who offers, through the kindly assistance of nitro-energy, to produce electrical energy at one-fiftieth "present cost," whatever that may mean. That by the way. We were talking of the leaning of electrical engineers towards coal carbonization with bye-product recovery, and the utilization of the gas produced (including that from the gasification of coke) for firing steam-boiler plant. Associated with this is the view of some electrical engineers that they have enough to do in looking after the generation and sale of electricity, without being troubled with all the specialist work of a gas engineer and chemist; and they would rather see the gas and bye-product manufacture retained by the latter. But though gas helps the electrical industry so much through gas-heating in the production of its goods, though it furnishes coke to many important electricity stations (which have been equipped with the inexpensive appurtenances necessary to the efficient utilization of this fuel), and though its tar distillation plant supplies tar oils to the constantly erring Diesel engines, any collaboration between the gas and electricity industries is scouted by some superior electrical engineers as being altogether out of the question, just as they also think, despite the experiences at Alloa and elsewhere, that the conjunction of gas and electricity supply in one undertaking is wrong in principle, although they cannot argue that it is so economically.

FUEL WASTING AND REFORMS.

The gas industry does not mind the slighting of these superior persons. "Imitation is the sincerest form of flattery." The gas industry values as such the desire of electrical men that they shall become gas producers, as well as makers of other valuable commodities, including a reputable fertilizer. Acknowledgment is made in other ways of the need of sweeping reforms in the electrical industry. There has been publication during the year of fuel consumptions at generating stations varying from 14 lbs. to between 2 and 3 lbs. per unit; and this shows the wastefulness in electricity generation, and the scope there is for reform. One means by which fuel saving and the prevention of interruptions of supply are to be effected is by the interlinking of systems. This is a method of economy long since contemplated, but little acted upon, until the Board of Trade urged its further consideration, with a view to fuel economy and the saving of capital expenditure. The Institution of Electrical Engineers appointed a Committee to consider reform, following the reading of a paper by Mr. E. T. Williams, in which was advocated the establishment of a Central Electricity Control Board responsible to Parliament. A Joint Committee, too, to prosecute an interlinking campaign was appointed by the Incorporated Municipal Electrical Association and the Incorporated Association of Electrical Power Companies; while local Interlinking Committees have sprung up like mushrooms all over the country. Only the Lancashire and Cheshire Committee have yet published concrete inter-connection schemes, whereby they predict an average saving of 0·5 lb. of coal per unit of electrical energy generated by the undertakings concerned—the saving on fuel, with coal at 17s. 6d. per ton, on present output, representing for Lancashire and Cheshire alone £82,000 per annum. But interlinking means capital expenditure and subsequent charges; and there are experts who doubt some of the economic virtues proclaimed for it.

REVELATIONS AND ADMISSIONS.

There has been during the year a luxuriant revelation of the weak places in the electrical industry. Perhaps it is as well—for the industry. It has found out through breakdowns how narrow is the surplus plant in many electrical stations, owing to past neglect; and many factories and the owners and operatives have learned that reliability is not one of the chief merits of electricity supply. The tram-using public, too, have had unhappy experience of the same thing; the shopkeeper and the domestic user have lamented their ill-fortune. An aerial visitor was successful in placing a bomb in an electric generating station; and this provides a case from the military point of view against large concentrations of generating plant. The industry has come to the conclusion that, at its birth and since, many of the things that were and have been done ought to have been done much better, or to have been left undone. Dublin may be taken as an example. There have also been allegations as to a financial "rottenness" in many electrical concerns. With such a forefront undertaking as that at Sheffield, it is admitted by the Electrical Engineer (Mr. S. E. Fedden) that, "while the undertaking has complied with legal requirements in respect of repayment of loans in the shape of sinking fund, capital indebtedness is not being reduced fast enough to keep the concern financially sound." Mr. Fedden advocates strong reserve, renewal, and special expenditure funds. The circumstances of Sheffield in these respects are only those of hundreds of other electricity concerns in the country. The conditions as to cost of materials and the market value of money that will have sway for many a year after the war, will not brighten the outlook of those undertakings that have been careless of these matters. The electrical industry stands covered with confessions; but there has been little yet forthcoming, other than a torrent of words, indicating materially and emphatically the will and the intention to reform.

UNDER WAR CONDITIONS.

The electricity industry, like the gas industry, has suffered all the trials and torments of the conditions created by the war. The Treasury and the Local Government Board have continued callous to all pleadings for money for capital purposes; and perhaps this is a good thing in view of the high prices of copper and other metals, shortage of labour, and heavy labour costs. An industry whose capital charges are the heaviest part of its outgoings cannot want, or ought not to want, to pile up dear capital in the purchase of dear goods, though one never knows what an electrical engineer may require or endeavour to do. Another obstacle to the spending of money is the prohibition of the making and use of copper wire and cable, though there has been consideration of the possibility or desirability of carrying on as in Germany with iron or steel wire. Then there has been the coal question for the electricity industry as well as for the gas industry; and the two have joined hands in making representations in Whitehall. Coalowners have been indifferent to the position of the electricity industry in meeting current national requirements; they have

been more concerned about getting from it some 50 to 100 p.ct. higher payments for coal of lower calorific value and larger ash content than formerly, which has not been helpful to the best generating efficiency with the plant in use. Consequently, the 10, 15, and 20 p.ct. original war increases in the charges to electricity consumers have grown and grown, until there are instances where they are some 40 p.ct. greater than the pre-war ones; albeit the accounts of the undertakings do not look so healthy, and dividends have shown a marked shrinkage. To supplement revenue, some singular schemes of charging have been put forward; and consumers have resented the arithmetical problems that have been presented to them, just as they have in several places the enforcement of the minimum charge per quarter. Electricity consumers can be very cantankerous when they please; and they are often so pleased. Then, again, the reduced public and shop lighting, the earlier closing hours for shops, and the Summer Time Act have had a bad effect upon the accounts of undertakings innocent of a respectable industrial load. Where local authorities are the governors of the electricity concerns, they have in several instances taken from the pockets of the ratepayers the customary charge for public lighting, or a large part of it, and have handed it over to the electricity concern. Of course, in industrial areas where munitions work has been proceeding at high speed, the electricity undertakings have had their generating power put to severe test—in some cases to breaking point. Talking of charges, the rateable value system—the lump sum charge and (say) ¼d. per unit—has not been much heard of in these times of stress. If it did not pay before the war so well as the old tariffs, owing to the lower revenue derived from consumers for an increased consumption, it cannot pay now. Hence it has added to the load of burdens. An interesting development of the year is that the Hackney Borough Council have announeed their intention of trying conclusions with the Gas Light and Coke Company over the preferential charges question; but as they want the fight without bearing all the cost, they have, when contributions are badly wanted for the relief of human suffering, sent round to other electricity undertakings begging letters praying for succour or (as the lawyers would say) "maintenance."

LIGHT, HEAT, AND POWER.

There has not been much introduced during the year in the way of new electricity consuming appliances. The tungsten filament arc lamp has arrived, with its enormous intrinsic brilliancy; but it is not thought that the field for it will be large. The so-called "half-watt" lamps have made descent into lower-scale units; but even now conscientious electricians cannot claim greater efficiency for them than 1·5 candles per watt—that is with the exposed filament. But essential shading on account of the high intrinsic brilliancy reduces the effective efficiency. Among other matters in the lighting line that have been discussed in the course of the year has been the photometry of modern electric incandescent lamps. With the spiral-wound filaments, the horizontal measurement of the candle power is not approved, inasmuch as the spherical candle power returns a higher efficiency. The manufacturers of lamps have further pressed the claim to all ratings being in wattage, which, however, gives the buyer no indication as to illumination output, which varies so considerably with different types of lamp. The half-watt lamps in street lighting continued, owing to their labour-reducing merit, the congenial work of dislodging arc lamps. On the other hand, it is considered that, in view of the advancing economy of electric lamps, the undertakings that are mainly dependent on a lighting load will in time be badly crippled. There has occasionally been cheery advocacy of the fixed price lighting of artizans' dwellings. But, as a rule, the advocates dodge the question of costs; and time brings its revenge on those who adopt such an abuse of commercial principles. The notable thing is that the progress of such schemes is of a modest order, and in time cessation often results.

In regard to domestic heating, the bar element electric fires have not turned out altogether the success that the electricity supply industry had hoped for. The bars are made with a fire-clay or earthenware base, on which the wire or ribbon element is wound. Through the brittleness or hygroscopic nature of the base, trouble has resulted from the liability to chemical reaction between the fire-clay base and the high temperature element. The only suggestion of novelty during the year is what are called "flaming electric-fires," which are nothing of the kind; the term receiving only a very thin justification by reason of a "shimmering effect." It has again been shown that the continuous use of electric-heaters is only possible in the case of millionaires.

The men of the electricity industry have been very jubilant over the adoption in a few friendly business establishments and refreshment rooms (to which very special terms have mostly been allowed) of electric cooking appliances. A list of these to date appeared in the "Memoranda" for March 7. And what a few among so many existing similar establishments! In the domestic line, unreliability, time, and cost are working well for the gas companies, who have had the satisfaction of relieving from their misery several deluded temporary users of electric-cookers. The fiction of meat shrinkage has no weight with them, as intelligent users of cookers know full well that whether heat is obtained by gas or by electricity, if the temperatures are equal, there cannot be (unless something supernatural operates on behalf of electricity) any substantial difference in the weight of similar joints of meat. A good deal of information has been published as to an electric cooking campaign in America, where gas and electricity prices are not as here. There has been a transfer of affection from the old form of boiling-plate to that of the radiant type; but there are electricians who mistrust electricity for boiling on any form of plate. Hence the combined gas and electric-cooker—the gas being used for boiling; the electricity in the oven.

Water heating by electricity, owing to physical disabilities, continues to have stunted growth. Life is too short, activity too pressing, to wait for obtaining large successive supplies of water by such means. But among electrical people the necessity for not losing any more of the precious and dearly purchased heat than can be avoided has led to a preference for the use of thickly insulated tanks with immersion heaters. But consumers prefer the prompt response of gas or coke water-heating appliances, and so do not a few electrical engineers.

Electric power has been largely adopted in connection with munitions works; and gas-engine makers, busy as they always are, have been exceptionally so in supplying requirements for the same purpose. Both forms of power have their conveniences and economies under certain conditions; but, generally speaking, for heavy continuous work, the gas-engine holds its own in the matter of economy, and certainly in reliability, as many factories can and do testify. Among the costs attaching to the running of electric-motors is that of maintenance. Of course, the charge for maintenance has relation to the work put upon a motor; and the experiences of electrical engineers (as shown in the course of the year) vary as to the charge from 6 to 20 p.ct. on the prime cost. There are many electric undertakings that to-day find their power contracts a burden upon them, owing to negligence in not having a coal clause in the agreements; and coal is not the only higher charge upon the running of an electrical concern in these times. There will have to be an overhauling of electricity contracts when opportunity offers, as the components of costs which ought to be taken into account in making a contract are going to be higher for some years than they were prior to the war, unless an increasing efficiency irons them out.

It is stated that electric furnaces are making progress in the steel industry. The Sheffield Corporation Electricity Department have twenty such furnaces connected, and sixteen waiting for installation. We will not make these figures blush by putting them alongside the Gas Company's furnace connections.

From these general particulars, it will be seen that the electricity industry has not during the year strengthened its weapons for use in the competition with gas.

Metropolitan Gas Referees' Notification.

The Metropolitan Gas Referees intimate that they have no alteration to make in their "Notification" for 1916, beyond the correction of a single figure. For the present, therefore, the "Notification" referred to [see "JOURNAL" for Feb. 22, 1916, p. 410] will remain in force. In one of the footnotes, for "5 cubic feet of gas," read "3 cubic feet of gas."

Gas Lighting in a Cathedral.

The installation of semi-indirect gas lighting in the Cathedral of SS. Peter and Paul, Philadelphia, was described by Mr. J. D. Lee, jun., in a paper read at the mid-winter convention of the Illuminating Engineering Society of America. Explaining that it was in an effort to stimulate the best effect and provide comfortable easy seeing conditions that the artificial lighting was planned, the author said it would seem that the success of this installation marks a step in the progress of gas lighting. The progress that has been made from the time when open-flame gas-jets did service even for churches and other large public buildings, to the period when it was thought that electric lighting had all but driven gas from this field entirely, is an advance which is, indeed, very marked. Even the introduction of mantle-burners was not sufficient to stop the inroads electricity was making on this class of lighting. Nothing short of an innovation in lighting made possible the success of this gas installation. Semi-indirect lighting in which approximately 70 p.ct. of the light is delivered above a horizontal line drawn through the unit, is now made to accomplish results which, if contrasted with the former method of direct lighting, are remarkable. In short, this is the innovation in modern methods of utilizing light that bespeaks the success of gas lighting in the cathedral.

The present output of benzol and toluol in the United States is conservatively estimated to be 3½ million gallons per month or 42 millions per year. Of this total, 3 million gallons each month is benzol. When the new bye-product ovens still under construction are completed, the yearly output will easily exceed 50 million gallons per year, says the "Iron Age." Before the war the output was negligible in comparison.

Pyridine (says "Engineer") is not the only substance which has a high solvent action on coal constituents. M. Vignon states that aniline dissolved 23·4 p.ct., and quinoline 47·3 p.ct. (at boiling point) of a bituminous gas coal from the Loire district; while Parr and Hadley record the extraction of 35 to 40 p.ct. from "high-volatile" coal, and from 20 to 30 p.ct. from "low-volatile" coal, by treatment with phenol at 110° C. in an atmosphere of carbon dioxide.

GAS LEGISLATION FOR 1917.

[FIRST ARTICLE.]

ONLY eight Bills and two Provisional Orders relating to gas supply have been lodged for consideration during the current year; so that the industry will not be trespassing largely upon the time of Parliament in a period when there is a desire to concentrate the attention of our legislators upon the vigorous prosecution of the war to a successful issue for the Allies. With such few Bills, there is no need to classify them; and their review may proceed in alphabetical sequence.

The BLACKPOOL CORPORATION are promoting a Bill with the view to extending the boundaries of the borough so as to include within it the urban district of Bispham-with-Norbreck and part of the township of Carleton. They also desire the extension of the limits of gas and electricity supply, so as to include such part of the parish of Carleton as is not comprised within the gas and electricity supply limits of the Poulton Urban District Council. The Corporation are also proposing to have transferred to them the Bispham-with-Norbreck electricity undertaking. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

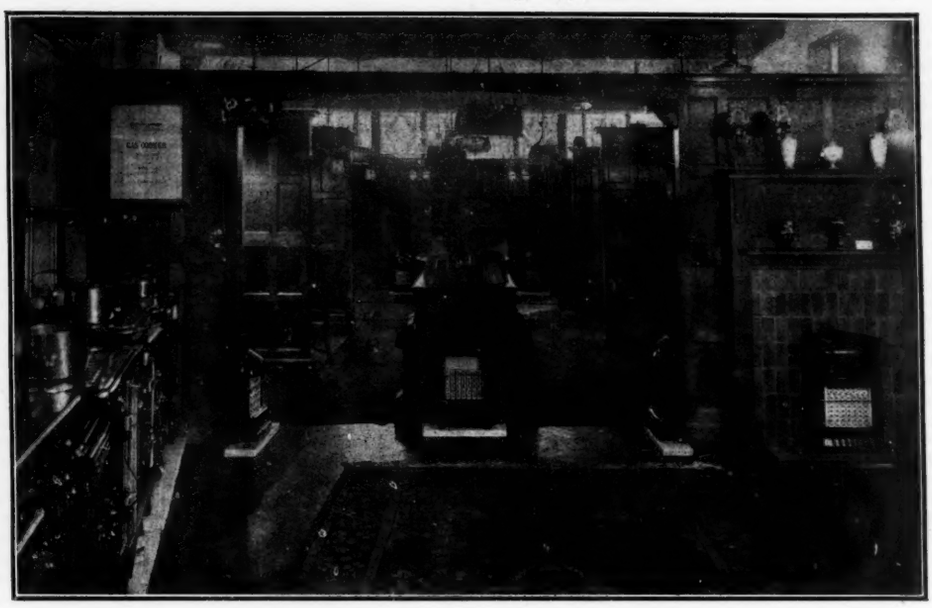
The GAS LIGHT AND COKE COMPANY are promoting a ten-clause Bill to confer upon them further powers. In their Act of 1873, the Company were authorized to apply, to the purchase, maintenance, and use of collier ships, lighters, and vessels, any sum or sums not exceeding in the whole £150,000. The Company now ask for further powers in the same direction, and for the right to apply to this purpose "any moneys raised, or for the time being authorized by any Act of Parliament to be raised by them, and not required for other purposes of their undertaking." Succeeding is a provision empowering the holding (in February, or such other month as may be determined by a resolution of the shareholders) of annual, instead of half-yearly, meetings of the proprietors. This necessitates sanction to the payment of a half-yearly dividend without the direction of a general meeting. The repeal is sought of section 11 (Use of Reserve Fund) of the Act of 1903; and the reserve fund of the Company, it is proposed, shall be applicable to the payment of dividend in accordance with the provisions of section 23 (Power to Create a Reserve Fund out of Dividends in Excess of the Standard Rate of Dividend and Application thereof) of the Act of 1876, as amended by section 35 of the Act of 1909. The Directors also desire authority to appoint one or more of their body to be managing-director or managing-directors of the Company, either for a fixed term, or without any limitation as to time, with power to "remove or dismiss him or them from office, and appoint another or others in his or their place or places." Accompanying provisions are that a managing-director shall not, while holding the office, be subject to retirement by rotation, and shall not be taken into account in determining the rotation of retirement of directors. But if he ceases to hold the office of director from any other cause, he shall *ipso facto* immediately cease to be a managing-director. It is contemplated that the remuneration of a managing-director shall from time to time be fixed by the Directors, and may be by way of salary or commission, or participation in profits, or by any or all of these modes. Also that the Directors may entrust to, or confer upon, any managing-director such of the powers as are exercisable by the Directors, and subject to such conditions as they may think fit, and may from time to time revoke, withdraw, alter, or vary all or some of the powers. There are clauses making further provision as to nominations by employees in regard to transfers of stock, and as to the registration of transfers of stock in the names of employees. [*Parliamentary Agents: Messrs. Dyson & Co.*]

The HASLEMERE AND DISTRICT GAS COMPANY are seeking incorporation and further powers. The share capital of the Limited Company now amounts to £23,435, in £5 shares, of which sum £10,500 is entitled to a maximum dividend of 10 p.ct. per annum, and the remaining £12,935 to a maximum dividend of 7 p. ct. per annum. Premiums have been received to the amount of £562. The Company have borrowed £5850 by the issue of debentures, bearing interest at the rate of 5 p. ct. per annum, and, in addition, they also owe on mortgage £350. With an increasing demand for gas, the Company desire further land and works powers. They wish for the repeal of the powers of the Godalming Gas Company in part of the parish of Witley. The latter Company are not supplying, and never have supplied, gas to that portion of the parish, and are willing it should be served by the Haslemere Company. These particulars are taken from the preamble of the Bill. As to the clauses, the first ones deal with the incorporation of the Company. The capital proposed is £41,435, divided into £23,435 of ordinary stock (and known as "original capital"), and £18,000 of additional capital, which the Company desire power to convert into stock as and when fully paid up. The original capital is to be divided into £10,500 of ordinary "A" stock and £12,935 of ordinary "B" stock. The "A" stock it is intended to divide among the holders of the 10 p. ct. capital in the proportion of £5 of "A" stock for each £5 of ordinary capital. The "B" ordinary stock is to be divided among the holders of the 7 p. ct. capital in £5 "B" ordinary stock for each £5 of ordinary capital held by them. Power is asked to the raising of the £18,000 additional capital either as ordinary shares or stock or new preference shares or stock. The Company seek to be authorized to create or issue all or any of the preference shares or stock or debenture stock so as to be redeemable on such terms and conditions as may be specified in a resolution to be passed at a special meeting convened for the purpose. "If it is so provided in the resolution, the Company may: (*a*) Call in and pay off the shares or stock, or any part thereof, at any time before the fixed date of redemption; and (*b*) redeem the shares or stock, or any part thereof, either by paying off the shares or stock, or by issuing to any shareholder or stockholder subject to his consent other shares or stock in substitution therefor." With the object of providing the money for the purpose of paying off the shares or stock, or of providing substituted shares or stock, the Company desire to be empowered to create and issue new shares or stock (either redeemable or irredeemable), or to reissue shares or stock originally created and issued under this section. "The Company shall not redeem out of revenue any debenture stock or preference shares or stock created under this section." These are the terms on which the creation and issue of redeemable stocks were allowed last session. The Company seek authority to borrow any sum or sums not exceeding in the whole (inclusive of the £5850 already borrowed) one-half part of the amount of the capital of the Company which at the time of borrowing has been actually issued or raised. The dividends proposed are 10 p. ct. on the "A" capital, and 7 p. ct. on the "B" and additional capitals. The Directors ask to be empowered to pay an interim dividend without the sanction of a general meeting; and annual meetings are provided for, to be held in October or at such other time as may be appointed by the Directors. The Company desire compulsory purchase powers over certain lands. Attached to the works construction and maintenance clause, are the residuals powers as included in the "Model Clauses" with appended the objectionable proviso to the purchase authorization that the quantity of any residual product so purchased by the Company in any year shall not exceed one-third of the quantity of the whole residual product which shall in that year arise directly or indirectly from the manufacture of gas by them. The limits of supply are described in one of the schedules, and in connection therewith it is sought to repeal the power of the Godalming Gas Company to supply gas in part of the parish of Witley. As to the price of gas, a maximum of 5s. 2d. per 1000 c.f., is proposed, with power to the Board of Trade, after the expiration of three years, to revise the price or substitute a standard price and sliding-scale on the ordinary terms. The Company seek for the substitution of a calorific value standard of 500 B.Th.U., in place of the illuminating power one. Among miscellaneous clauses is a stand-by one, and another empowering the Company to charge differential prices for different purposes. [*Parliamentary Agents: Messrs. R. W. Cooper & Sons.*

The HEMEL HEMPSTED DISTRICT GAS COMPANY are desirous of raising additional capital, and to obtain extended limits of supply, and certain further powers. It is explained in the preamble to the Bill that the whole of the capital has been raised by the issue of ordinary stock and shares, and no part has been raised as preference capital. The total paid-up capital stock is as follows: "A" 10 p. ct. stock, £12,000; "B" 10 p. ct. stock, £5500; and £10 7 p. ct. "C" shares or stock, £17,000. The loan capital consists of £2000 terminable mortgage bonds, and £6100 permanent mortgage bonds. Premiums have also been received to the amount of £3592. Regarding the extension of the limits of supply, the Company wish to include a part of Redbourn not at present comprised within the existing limits, with power to purchase the undertaking of the Redbourn Gas Company, which is now affording a supply of gas without statutory powers in a portion of the area to be included within the Company's limits. The first clauses refer to land and works; and there is attached the residual products provisions without the one-third purchasing restriction. Then comes the provision referring to the extension of the area of supply, and the purchase of the Redbourn gas undertaking, which belongs to Mr. Henry King Hillier and Mr. Clifford Holmes Hunt. Calorific power clauses follow. The calorimeter to be used is one to be from time to time agreed upon between the Company and the Corporation of the borough, or, failing such agreement, as is approved by the Metropolitan Gas Referees; and it is to be used so as to yield the total heat value of the gas. The standard proposed is 500 B.Th.U. As to capital powers, the Company desire to raise additional capital not exceeding in the whole £30,000 by the creation of ordinary "C" stock or preference stock. In respect of any preference stock hereafter created, it is suggested that "the dividend shall be at such rate as the Directors may determine at the time or times of the creation thereof." Borrowing powers are proposed on the one-third rate. In regard to redeemable preference and debenture stock, it is asked that the provisions of the Statutory Companies (Redeemable Stock) Act, 1915, shall extend and apply to the Company as if any preference or debenture stock which the Company are authorized to raise under the powers of this Act were such preference or debenture stock as is referred to in section 1 of the 1915 Act. Special purposes and benefit funds are provided for, as well as benefits to employees injured, and dependants of employees killed, in the war. The Company ask for power to enter into and carry into effect agreements with any company or person for the supply of gas in a crude or partially purified state. A differential price clause also appears; as does also one referring to the appointment of a managing-director. An annual meeting in April or May and the payment of an interim dividend are provided for. Profit-sharing clauses are included, as is also one empowering an application for an Electric Lighting Order. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

DERBY GAS COMPANY'S NEW SHOW-ROOMS.

THE opening in February last of the Derby Gas Light and Coke Company's new show-rooms, marked the completion of important extensions and additions to their Friar Gate offices and premises which were commenced about eighteen months previously. Some particulars of these handsome show-rooms were given on p. 489 of the "JOURNAL" for Feb. 29 last; and the following additional information has now been received from Mr. J. Ferguson Bell, the Engineer and Manager of the Company—the accompanying photographs being the work of Mr. C. B. Keene, of Derby.



The show-rooms, which occupy the site of the old room on the ground floor formerly used for similar purposes, together with space at the rear and previously occupied by a corridor, inner hall, staircase, and inquiry office, cover a very large area; and the opportunity thus afforded for the making of ideal show-rooms has been utilized to the full. From the main entrance lobby of the building in Friar Gate, one enters through a doorway opposite the public rental office into a waiting-room; and no sooner is the threshold crossed, than one is filled with admiration. It is an exceedingly cosy apartment, tastefully furnished in oak. There are a gate-leg table and upholstered chairs; and as the soft carpet is traversed an air of comfort is apparent. The walls are panelled in oak; and a corner fireplace having a charming chimney-piece and interior, harmonizes to a degree with the beautiful surroundings. Glancing round the room, a number of handsome gas-fittings of artistic design and finish, and exceedingly pretty shades, are noticed.

Passing on under a fine broad panelled archway, supported upon four classic columns with carved capitals, the show-room is approached; and an ingle recess, with its fireside seats flanking a beautiful chimney-piece and a gas-fire of unique design, command immediate attention. Some small compartments, divided by oak panelled partitions, are seen upon both sides of the large room. Each alcove has its own chimney-piece, with a marble or tiled surround, in which is placed a gas-fire; the combinations being in every respect so effective, though different from one another, that even the most fastidious taste may be certain of being gratified. The furniture about the show-rooms is oak, and is particularly well adapted for the comfort and the benefit of the public; and illustrated booklets and catalogues of every description are in evidence upon the tables.

Further on, another large apartment is entered. Here the walls are daintily tiled. On the one hand are exhibited several of the most modern and complete cooking-stoves, utensils, and appliances for domestic use, which are sure to entertain the housewife. On the other hand, types of radiators for school, home, or garage use are on view; and specially interesting are the water-heaters and circulators, with their perfect control of the gas supply, thus eliminating the possibility of wastage. From the ceiling are suspended many lighting fittings of artistic and modern patterns;

and numerous brackets of neat design adorn the panelling of the walls and partitions. The polished oak floor and luxurious carpets add to the magnificence of the effect obtained.

A handsome window fronting to Friar Gate attracts attention. A beautiful chimney-piece and interior with a marble surround and curb upon a polished parquet floor are on view. Without doubt, the Company can boast of possessing show-rooms equal to any existing in the country.

For the better accommodation of the staff, and in order to facilitate the working of the several departments, two additional wings have been built, which comprise, on the one hand, the show-room manager's office and an annexe to the show-room on the ground floor, the offices of the engineer's staff and waiting-room on the first floor, and the inspectors' and collectors' offices and drawing-office on the second floor; while a comfortable dwelling-house for the caretaker occupies part of this extension. On the other hand, there is an office for the use of the rental department, cloak-room, pay office, and counting-room on the ground floor, and a tea-room on the first floor.

The general contractors were Messrs. W. Ford & Sons, of Summer Hill, Victoria Street, Derby; and the work in connection with the show-room was carried out by Messrs. Ward & Croft and the St. George's Guild, of No. 3, Newhall Street, Birmingham, under the superintendence of Mr. T. H. Thorpe, F.R.I.B.A., of St. James' Street, Derby.

Belt Conveyors.

An article on this subject appeared in a recent number [Vol. LI., No. 5] of the "Engineering Magazine," New York. The author, Q. Trautschold, points out that material supplied in an adequate and continuous stream can be handled more expeditiously by belt conveyor than by other form of material-handling equipment. For handling loose material, a troughed belt is required; and, though the load that can be supported by a foot of belt is not great, the capacity of even a narrow belt is surprisingly high, owing to the speed at which a belt may be run. For instance, under perfect loading conditions, a belt conveyor only 12 in. wide can handle nearly 90 tons of sand per hour, while one 36 in. wide has a capacity of 800 tons per hour when run at a speed of 375 ft. per minute. Considering a specific belt conveyor installation, one handling 85,000 tons of fine coal per year may be taken as typical and well illustrating the economic value of the device. Such a conveyor, 500 ft. long, elevating the load 30 ft. in its travel, and distributing it to an overhead bunker 100 ft. in length, would not be an unusual installation. With power delivered to the conveyor drive costing 2 c. per h.p., the net operating cost per ton, including all charges, is 1·957 c. with pin-bearing idler, and 1·629 c. with roller-bearing equipment.

Sulphate of Ammonia Exports.—"It is believed," said "The Times" last Wednesday, "that the Board of Agriculture have resolved rigidly to prohibit the export of sulphate of ammonia. In arriving at this decision the Board are stated to have had the active co-operation of the Sulphate of Ammonia Association. The importance of the step can hardly be over-estimated; for, in addition to making it certain that there will be no leakages to enemy countries, it will secure for home use in crop production an adequate supply of a very valuable fertilizer." This statement, so far as the Sulphate of Ammonia Association are concerned, is not in accordance with present facts, though what may happen in the future it is, of course, impossible now to say. Exports of sulphate of ammonia have not yet been prohibited.

NITRATE STATISTICS FOR LAST YEAR.

THAT nitrate of soda in the immediate future cannot well be cheaper than it is to-day, and may very easily be dearer, is the opinion expressed by Messrs. W. Montgomery & Co., Ltd., in their half-yearly report. They see some cause to fear that supplies for the coming season will be short, unless they can be augmented by steamer shipments in the first three months of this year—of which at the moment there is not much prospect.

On the subject of values, they point out that during the past six months free on board prices in Chili have steadily advanced to the extent of 30s. to 40s. per ton. The July quotation was about 7s. 2d. per quintal for ordinary quality, and 7s. 9d. for refined, both for that and this year's shipments in monthly lots; whereas now the quotations are 9s. 3d. and 9s. 6d. per quintal for ordinary and refined, for shipment January to June, or 9s. and 9s. 3d. for the whole year. Even 1918 has shared in business done at 8s. 3d. for ordinary and 8s. 6d. for refined; and this is quoted as strong evidence that, in some quarters at least, a hopeful view is taken of the industry, "when, presumably, war will be no more." With reference to this forward business, attention is drawn to the need for caution, inasmuch as there must be doubt as to what new features in the industry the necessities of war may have brought about. For one thing, they say, it is tolerably certain that, even if no new discovery has been made, there will be a great deal of machinery for the manufacture of synthetic nitrate in Germany which may become, on the basis of its new capitalization, a formidable competitor for a time with the Chilian nitrate. But, in face of the German peace offers, the prices now obtaining for Chilian nitrate for 1917 are perhaps almost more dangerous from a purchaser's point of view, being relatively so much higher.

Writing before the decision of the authorities to fix the price of wheat at 60s. per quarter, Messrs. Montgomery, alluding to the arrangement come to with makers of sulphate of ammonia, expressed the opinion that, though all could appreciate the good intentions of the Board of Agriculture, the increased production of cereals and root crops in the United Kingdom might be more surely secured by a Government assurance to farmers and producers of foodstuffs generally that prices would not be allowed to fall below a certain figure for the next twelve months. What has been done, of course, is not quite the same as the fixing of a minimum price, as suggested here; but it is, at any rate, a step in that direction.

The uncertainty of the position generally will be gathered from what is said in the report as to consumption and stocks. Consumption in the United Kingdom is declared to be an unknown quantity at present; and in Continental ports also the figures are unobtainable. America shows a considerable increase during the past six months; while the figures for the twelve months are 1,105,000 tons, against 790,000 tons. Stocks in Europe, too, are an unknown quantity. The figures of production for the year are given as 63,300,000 quintals, against 38,123,000 quintals during the previous twelve months; stocks in Chili being about 16,300,000 quintals, as compared with 17,099,000 quintals. Notwithstanding the high price, there is to-day no difficulty in selling nitrate.

Another of the regular reports is that by Mr. Thomson Aikman, jun., who, dealing with 1916, says that the market has been a difficult one to judge at any period of the year, and will almost certainly remain so during the war. The outstanding feature, however, has been the fact that shipments have equalled, and even slightly exceeded, production, in spite of the difficulty of securing tonnage. Figures given for the production of 1916 and 1915 are practically the same as those quoted above—63,200,000 and 38,200,000 quintals respectively. The production for the year 1914 was 53,500,000 quintals. Both the production and shipment figures for the past year, it seems, constitute a record for the nitrate trade. Here, again, a condition of great uncertainty is admitted, in the remark that it is quite impossible in present circumstances to ascertain the actual consumption. While there appears to be no doubt the consumption has been large, he says it would be very unwise to assume that shipments mean consumption, as there is no way at present of ascertaining to what extent stocks are being accumulated either in Europe or in the United States. The value a twelvemonth ago for spring delivery was about 13s. 7½d. per cwt., cost and freight, as against the present price of something like 16s. 10½d.

Fuel Economy and Briquettes.—It was urged by Messrs. Lantsberry and Paton, in a paper read before the Manchester Geological and Mining Society, that a good deal of the nation's coal supply might be profitably used in the form of briquettes. In many collieries, they said, much of the coal got was not brought to the surface because it was regarded as too small for use; while other seams were left untouched because the coal was poor or the seams not thick enough. The value of the bye-products which could be obtained by the proper treatment of the coal might be anything up to £15,000,000; and still there would be left behind a solid residue which could be worked up into a smokeless fuel eminently adapted for burning in a properly designed domestic grate. The authors pointed to what Germany had done in this direction; but the Secretary (Mr. N. T. Williams) suggested that one reason for German pre-eminence in briquette making was that most of the coal of the country was very soft, and therefore lent itself readily to the work.

THE ORGANIZATION OF THE COKING INDUSTRY.

By Professor L. T. O'SHEA, M.Sc.

[A Paper read before the Midland Section of the Coke-Oven Managers' Association, Dec. 23, 1916.]

It is with some feelings of diffidence that I address your Association on the subject of the organization of your industry. I cannot claim to your intimate knowledge of the practice of the industry. I may be accused, perhaps with justice, of having only a theoretical and not a practical knowledge of it, and be found guilty of presumption and temerity. At the same time, it is known to most of you that for many years past I have been closely associated with coal distillation; and I am willing to risk the accusation and indictment at a moment when a body of men like yourselves have united together with one object in view—namely, the prosperity of the industry to which you belong. It is with pleasure that I learn that the sphere of your activity is to be national and not local. From this, I conclude your desire is to assure the success of your industry as a national one; and the success you look forward to is not merely that of financial prosperity but that which follows the development of its resources to their utmost. To secure this, it is necessary that the industry should be organized; but this organization must not, in my opinion, be such as merely to protect the narrow interests of individuals. It should be an organization which allows freedom for originality and enterprise to exercise their influence on its development.

The industry, in this district at least, has arisen by individual and not concerted effort; and before any successful organization can be initiated, it is desirable to have a clear view of the goal to be aspired to, and to give careful thought and consideration to the means whereby this goal is to be reached. The first essential to these ends is a clear realization of the extent of the industry, and the possibility for its future development; and then to consider the actual steps to be taken to lay the foundation for future success.

I propose, therefore, first to deal with the extent and possibility of development of the industry; and if in doing so I refer to what is known to most of you, I make no apology, as I feel sure that no harm, and possibly some good, can come from its reiteration.

COAL RESIDUALS THE ESSENTIALS IN OTHER INDUSTRIES.

The material handled is the raw material from which products either in the crude or refined state are essential for the needs of other industries. To us who are coke-oven managers, the bye-products of coal distillation are represented by tar, ammonium sulphate, and benzol; but I think that the confession must be made that, up to the outbreak of the present war, few were interested in the subsequent treatment or use made of these products. In a paper read before the Midland Institute of Mining, Civil, and Mechanical Engineers by Mr. E. Lloyd just twelve months ago is given a very concise résumé of this part of the subject, which will repay anyone to carefully read and digest who has not already done so. In it is shown how important the coal-distillation industry is, and how large a number of other industries are dependent on it for their raw materials.

The world's supply of ammonia is chiefly obtained from coal; and for years past it has mostly been converted into sulphate at coke and gas works for sale as a fertilizer. But it has wider uses. The great cold-storage industry on which our food supplies are to a certain extent dependent, as well as the freezing method of pit-sinking—in fact, almost every industry or process that requires the production of low temperature—depends on the production of ammonia. The manufacture of all our modern high explosives requires supplies of ammonium nitrate, while ammonium chloride and carbonate are essential to the woollen, dyeing, electrical, galvanizing, and even drug industries.

Tar is, I think, generally looked upon as a wonderful source of valuable products; but I wonder if the extent to which other industries are dependent on its supply is fully realized. You have only to read Mr. Lloyd's paper to understand how numerous they are. The value of coal tar as we know it arose through the discovery of the organic dyes; but its importance has risen greatly since then. The pre-war value, and perhaps also its present value, is chiefly dependent on the presence of aromatic compounds—viz., benzene, toluene, xylene, naphthalene, anthracene, carbolic acid, cresol, &c. These bodies contained in the various crude fractions of tar distillation are required for the manufacture of dyes, explosives, drugs, photographic chemicals, perfumes, antiseptics, and even essences and flavourings. At the present moment, when all our energies are directed to operations of war, it is benzene, toluene, and carbolic acid which are chiefly required for the manufacture of explosives. But in the future large supplies of tar will be required for other than the explosives industries.

The remarkable solvent properties of benzene and its homologues renders them a valuable and necessary commodity in the rubber and fat industries.

The supply of benzene and toluene in coal tar itself is really very small. The greater portion of these bodies is found in the gas from which in coke-works it has nearly always been stripped and recovered as benzol; and now, owing to the increased demands of the country, it is similarly obtained from gas-works. This benzol forms an additional supply of crude material for the industries already mentioned.

The resources just narrated are well known, and perhaps an apology is necessary for mentioning them. But they by no means exhaust the possibilities of developments of coal distillation. There are problems ahead which offer a fertile field for development and research. There is a large proportion of non-coking coal, for which up to now no use has been found; and this is at present lost to the nation. The possibility of its distillation is a fascinating problem; but the real solution lies in finding a satisfactory use for the non-volatile residue, and the determination of the yield and value of the crude bye-products of the distillation. A solution of these two problems would also increase our national resources of fuel.

LOW-TEMPERATURE COAL DISTILLATION.

The question of the low-temperature distillation of coal has occupied the attention of a few in recent years, and is one fraught with great possibilities. For reasons into which it is not necessary now to enter, it has not made much progress. While it can never yield tars required for the present uses to which high-temperature tars are put, there appear prospects of a fertile field for development and financial success in the production of fuel for all classes of internal combustion engines, and for use in ships—to say nothing of a substitute for coal for domestic use. The coke-oven manager may say this is nothing to do with me; the low-temperature distiller is my competitor. To him I reply: You are a coal distiller; and it is a mistake for you to ignore any possibility in connection with your industry.

RECOVERY OF SULPHUR.

Other problems also await attention. Firstly, the recovery of the sulphur in coal. It is a fact that the amount of sulphur in coal if converted into sulphuric acid would yield more of this substance than would be sufficient to convert the ammonia obtained from coal into ammonium sulphate. Its recovery has been carried out in the best-managed gas-works; but up to now it has received little attention in coke-works. In one coke-works to my knowledge (and perhaps in more), the sulphur in the gases is recovered and converted into sulphuric acid. But the German inventor, with that far-seeing thoroughness characteristic of his race, has devised at least two processes as substitutes for the old and time-honoured one. These are the Feld and Burckheiser processes. They are both highly ingenious; and although at the present moment they cannot be said to be successful, still it is impossible to say how far they may be developed by persistent and careful research.

REFRACTORIES AND CYANOGEN RECOVERY.

The most suitable refractory material to resist the destructive action of salt has yet to be found. It is a problem forcibly impressed on the coke manufacturers in the South Yorkshire district by the long account for repairs that is so common there.

The recovery of cyanogen has also attracted some attention in the past; but it is still a problem which awaits a satisfactory solution.

ECONOMIC USE OF GASES.

To enter into the problem of the economic use of the gases would occupy too much time; but it is one of extreme importance from a national standpoint. Whether the best use is being made of the proportion of gas we consume, should be carefully considered; and is it not a fact that at present a very large proportion of a valuable source of energy is being wasted? The consideration of the prevention of this waste by the erection of central power stations, or by its use at the works themselves for the generation of electric energy, is a great economic problem in connection with the conservation of our coal supply.

These are a few of many problems which confront the coal distiller and call for solution either at once or in the near future; and it is for the coke oven manager, as the expert, to consider them and advise on them.

POSITION OF THE BYE-PRODUCT COKING INDUSTRY.

Now, gentlemen, I do not think you will deny that, so far as the coking industry is concerned, there are possibilities for development, but that if we look at the progress made it can hardly be said to be commensurate with its possibilities. The bye-product coking industry is one of recent development in England. Early attempts in the middle of last century resulted in failure; but towards the end (about 1898) Mr. G. Blake Walker was the pioneer who gave a lead in coal distillation to the colliery industry in South Yorkshire. His venture was watched with interest, but I think at the same time with a certain amount of scepticism. To-day this scepticism has disappeared; and there are few collieries which are fortunate to possess a good coking coal that

have not their batteries of bye-product coke-ovens. These plants have in most cases been added to the various undertakings associated with a colliery—perhaps as a fertile source of revenue. [One might ask if the colliery industry has had a true conception of the nature of the industry on which it has embarked or its possibilities.] From small beginnings, an industry of considerable dimension has arisen. Mr. Lloyd, in his paper already referred to, states that in 1913 the quantity of coal carbonized in retort coke-ovens was about 13½ million tons. The quantity of the crude products obtained is difficult to estimate; but Mr. Lloyd says that, while before the war the yield of benzol was 3 million gallons per annum, in 1915 it had risen to 15 millions, and is probably now about 25 million gallons. Taking the average yield of tar at about 5 p.ct., 675,000 tons of tar may be expected. From the benzol obtained by its distillation, together with the crude benzol from coke works, about 30 million gallons of finished products may result. The ammonia obtained is equivalent to about 1 to 1½ p.ct. of ammonium sulphate; and the yield was 133,816 tons in 1913, and 137,430 tons in 1914. Slowly, this industry has grown as an adjunct to coal production; and it only requires handling with the skill and judgment born of a knowledge of its possibilities to raise it from the handmaid of the collier to take its proper place among our great national industries.

Coal Carbonization a Chemical Process.

To do this, organization is necessary; and perhaps now is an opportune time when organization is the passport to success. To organize it, the first thing to realize is that the colliery manager who embarks on coal distillation has taken under his control a chemical industry, and therefore becomes a chemical manufacturer. All chemical manufacturers realize that their processes must be carried out under conditions controlled by certain laws, the infraction of which must necessarily lead to disaster. Once the conditions are known, they can and must be controlled from the laboratory; and only when this is efficiently done can success be achieved.

The next point to realize is that, whereas the majority of chemical manufacturers start with materials of definite chemical composition to produce new compounds also definite in their composition (often by chemical processes whose courses are more or less well known), the coal distiller starts with a substance of unknown constitution to produce results under conditions which cannot be said to be identical for all the different varieties of coal which he has at his disposal. In this respect, he is somewhat at a disadvantage. While the literature on most chemical manufactures may be taken as a safe guide for their conduct, in the case of coal distillation, it can only serve as a general guide; and the most favourable conditions for any one class of coal must be obtained by experience. The task of the coal distiller is a difficult one, calling for sound and wide knowledge, as well as practical experience and judgment on the part of those who are called upon to control the process. In my opinion, the first step towards organization, after realizing that control is necessary and possible, is to secure properly trained men to exercise it.

Working Tests.

Given the proper conditions for working, the control of the process largely devolves on the laboratory. Several points of control suggest themselves, which should be matters of daily routine, and are found in the best-managed works. Among these is the maintenance of proper distillation temperature dependent on the proper combustion in the flues and the calorific power of the gas. It should be a matter of daily routine to check the combustion by analysis of the flue gases, which may be confined to the estimation of the CO_2 by means of recorders. Daily records of the calorific power of the gases can also be obtained by means of automatic gas calorimeters; and thus a check can be kept not only on the combustion in the flues but on the composition of the gas. Any irregularities can thus easily be notified, confirmed by special analysis, and their cause ascertained and removed.

Daily determinations of the amount of ammonia and benzol passing away in the gas can easily be made if apparatus for the purpose is permanently fixed up in the laboratory; while periodical determination of the total ammonia and benzol in the gas will serve as a check on the efficiency of the scrubbing plants. Systematic determinations of the dirt in the coal if carried out daily serve as a check on the efficiency of the washer, and supplement the daily analysis of the coal and coke. The records of temperatures in the various parts of the cooling and washing plants give important indication of irregularities. The benzol plant can largely be controlled by temperature records; and while for purposes of simplicity of working the men in charge may be given routine orders based on time and quantities, temperature records are the means whereby irregularities are discovered and rectified.

Control of this character must be organized and under the supervision of a competent chief, skilled in the technique of the process, and in the details of the construction and working of his plant. Under his supervision and routine, work can be carried out by duly qualified but less highly skilled men.

Association between Chemist and Engineer.

While the control of the process is largely chemical, there is in addition the construction, working, and maintenance of the plant which is equally important. This requires the closest association between the chemist and the engineer. The manager, if a chemist, must have a knowledge of engineering. I do not mean mechanical engineering, but chemical engineering. It is often the weakness in the training of our chemists that we turn out pure chemists, and neglect the engineering side. Many chemists are handicapped by want of engineering knowledge which would enable them to judge how far it is possible to carry out their ideas on a working scale. Given this knowledge, then, with the assistance of the mechanical engineer, developments and improvements become easier, and failures fewer.

The Coke-Oven Chemist's Training.

If I am right in my views, the control of a coke-oven plant should be in the hands of a chemical engineer; and it is of importance to consider of what his training should consist. A teacher is apt to become dogmatic on the subject of the training of pupils. It is his profession; and he may be inclined to insist on the correctness of his views in a manner which is perhaps common to all experts. It is, however, in my opinion, desirable that teachers and those who control the industries should exchange their ideas on the subject of training. If, then, I now proceed to place before you my idea of what the training should be, it is in the hope that from the discussion which may arise I may learn from you the views of your Association.

The man who aspires to manage and control a coal-distillation plant must have thorough knowledge of chemistry up to the standard of a degree in science. For this branch of industry, specialization in organic chemistry would appear important, and physical chemistry should not be omitted. Physics should include chiefly heat and electricity up to an intermediate standard; and mathematics pure and applied up to the same standard. He should also have such a knowledge of French and German as will enable him to consult the foreign literature. The training in these subjects of pure science should be followed by a course of applied science, which should include such subjects as building construction and mechanical drawing, heat-engines, elementary principles of mechanical and electrical engineering, and a sound knowledge of chemical engineering and the chemistry of coal and bye-product recovery.

Such a course would require perhaps three or four years to complete. Let me assume it is a three years' course. The first years of study should be devoted entirely to the pure science subjects, which should include lectures and laboratory work. The chemistry would be continued through the second and third years; but the mathematics and physics should be completed in the first year. The second and third years I suggest should be devoted to the applied work, with the stipulation that in the third year nearly the whole of the time should be devoted to chemical engineering and the chemistry of coal and bye-product recovery. Really, these two subjects should be of the nature of a post-graduate course, to be taken when the foundations of pure science and engineering have been laid, on which to build the specialized structure.

In all these questions of education in the application of science to industry, there arises the point of how far it is desirable to combine instruction in the lecture room and laboratory with practice in the works. I believe in the closest possible association between the school of instruction and the works. If the two can be carried on concurrently, I believe association with works' practice steadies the student and gives him a stimulus to prosecute his studies with greater thoroughness and enthusiasm. At the same time, training in observation and reasoning makes him more observant, and perhaps enables him to think more clearly over the practical problems he meets with. But my experience has taught me that his attention must be undivided. When studying, he must not be distracted by duties to be carried out for his works' manager. We are told no man can serve two masters; and, when a student is studying, his sole master must be his teacher.

I believe, however, it is possible to associate study and practice. It is already done in the engineering school at the University of Sheffield, where pupils in engineering works are admitted for the six winter months at the University, and spend the remaining six months of the year at the works.

If training on these lines were agreed to, I think the proper plan to adopt for training the coke-works manager would be for the pupil to devote the whole of the first year to his pure science subjects, undistracted by the complex problems of manufacture, and then perhaps combine his studies with practical experience. This course would probably lead to the extension of the training to four years. But when his training is completed, are we to suppose that the student is ready to accept the responsibility of the management and control of works? I do not think so. But what he would be able to undertake would be the part of chief chemist—competent to control the laboratory or undertake research. To finally fit himself for the more responsible position of manager, he must enlarge his outlook, and acquire a practical experience of the details of the process of manufacture in some more or less subordinate position in the works. Do not mistake me, my firm conviction is that, when the student's training ends, his education for posts of responsibility begins.

With regard to the question of research, a great deal might be said. To deal with the subject thoroughly would prolong this paper beyond reasonable limits. It is doubtful if the English manufacturer has placed the same value on research as his

foreign competitor. It is, however, realized that the German nation has reaped a very large harvest as a result of their exploration in the domain of scientific and industrial research. The coking industry is an example of this; and another example is to be found in the prosperity in certain of our industries of individual English firms who have been prepared to spend money on research, and collect round them highly trained men, capable of carrying out investigations. It has been a good investment. To industrial research, Institutions like yours can give much assistance and encouragement; and, among the many ways, the selection and training of young men of ability and promise is not the one of least importance.

THE POSITION OF THE SHEFFIELD UNIVERSITY.

Now, gentlemen, I believe your Association is well aware that if the coke and bye-product industry is to be organized as a sound, healthy, and prosperous industry, capable of being developed to its fullest extent, successors to yourselves must be forthcoming who are competent to step into your places in the future. Also that you are desirous of enquiring into the question of the training necessary for their equipment, and that you are aware that something more is necessary than attendance at evening classes in bye-product analysis to turn out men fit to accept the responsibility of management. I would ask you, therefore, to discuss the subject. Consider also what other Societies have done to raise the standard of education of those about to enter their respective industries. I can assure you the University of Sheffield will hail the opportunity of placing its resources at the disposal of your industry for the education of its adherents and research in its subjects. If you succeed in bringing about the better organization of your industry, development will follow, and you will carry out a work of national importance.

PUBLICITY SCHEME IN CONNECTION WITH GAS LIGHTING IN THE UNITED STATES.

A report from the Illumination Committee, presented at the recent annual meeting of the National Commercial Gas Association, presents a strong case for more prominence and more publicity on behalf of the lighting branch of the gas industry than has been usual with gas undertakings in the past. It emphasizes the remarkable improvements that have been made in the available sizes and types of gas lighting units, in burner efficiencies, in the design and construction of appliances, in the variety, utility, and beauty of the enclosing media, in safety, as compared with any other service of energy, as is proved by the public fire records.

The hygienic advantages of improved and assisted ventilation and sterilizing effect on organic matter that may be present in the atmosphere have been proved by most competent authorities. The soft, restful light, very closely approaching to daylight in colour value, necessitating no considerable losses for correction (which are required when some other commercial units are used), is a decided advantage as beneficial to the eyesight; and if colour effects are desired, they can be easily and economically obtained. The double chain pull and bye-pass or pilot make the ease of operation all that can be desired; and efficient methods of distance control are also available. Gas lighting is still in the lead as regards cost and flexibility. Such unique advantages called for advancement on the part of all interested in the sale of gas, and promised greater attention in the future to continued improvement in fixtures, accessories, and glassware.

The opinion that gas was not in the running, as compared with other modern sources of illumination, was most effectively contradicted by the degree of success that has attended energetic effort in many cities and districts. The present send-out of gas for lighting purposes had been estimated as approaching towards 50 per cent. of the total output; and if the same promotive effort is applied to it that has been extended to fuel and power business, there will be an equal return from lighting to that of other branches. Many of the combination gas and electricity companies were carrying on strenuous and continuous effort in the way of securing and extending the use of gas lighting; and if there was no profit in the lighting business, they would reconsider this policy, and seek to discountenance gas lighting as being an unprofitable line. The field for gas lighting might be divided into existing and prospective business; and leaving out of the question for the moment the possibilities of the future, the extent of the existing business proved the fallacy of the argument that there was little or no demand or prospect in this direction.

Taking forty cities as representing every part of the States, and having a population of some 16,000,000, there were 4,380,522 gas-meters in use, and 1,691,130 electricity meters. Even allowing the extreme assumption that there is a gas-meter in every location where an electricity meter is installed, there remained the respectable number of 2,689,392 locations where gas alone was at present available for use—nearly one-half of the total number of gas and electricity users—available for immediate energetic effort, apart from any considerations as to future business in new buildings, or that might be secured as displacing some other illuminant at present in use. Beyond all possible doubt, modern gas lighting presented an extensive field in which to work.

But if no effort was made to care, if only for the existing business, most of it, if not all, must eventually be lost; and one can hardly suppose that the gas industry wishes to remain inactively watching the existing business drifting slowly away. The loss of other lines of business would follow as a natural consequence, and such an undesirable result can only be prevented by energetic and intelligent action. The advantage of holding the lighting business is that the use of gas for this purpose is more in evidence, more apparent, and more continuously in front of the user, than any other application of gas; and attractive modern lighting was a widespread and far-reaching advertisement for gas and for gas companies. There was no business that could not be assisted by good, clean, attractive publicity; and the gas industry could apply it in this instance to great advantage, not only to the benefit of lighting, because unconsciously the consumers associate satisfactory service in one department with the general use of gas for any purpose. A consumer who was quite satisfied and pleased with his gas lighting, was an easier prospect to deal with, for fuel or power, than one who had given up its use for this purpose.

In order to retain existing business, however, it was necessary to displace by modern appliances old-fashioned, unsightly, inefficient, and often unsafe fixtures, the flat-flame burner, and the cheap antiquated mantle burner. The Committee strongly recommend inaugurating a co-operative and concerted movement in this direction, apart from, and in addition to, the adequate and complete piping and modern fixtures in all new buildings. They also felt that the success of gas lighting, in the future, depended on maintenance. One could not hope to give the fullest and most satisfactory service possible in the absence of a satisfactory and adequate maintenance system, taking in the whole of the district and all classes of lighting, that would secure the co-operation of the consumer, the maximum efficiency of burners and equipments, and should be as nearly self-supporting as was practically possible. The experience of many gas companies had proved that these conditions were well within reach, but that the detail must be varied to suit local circumstances and restrictions, and that a maintenance scheme was a source of profit to the company, as securing satisfied customers, an increase of good will, and an extended demand for gas.

Although gas lighting was better adapted to favourably influence the consumer than any other service—with the exception, perhaps, of cooking—it had hitherto received the smallest amount of publicity, and the public knew least about it. For the reasons above stated, it should rather receive the greater share. But in regard to all branches of the industry, advertising could be well applied by means of a system that would ensure a continuous supply to the press, magazines, and periodicals, of information that would tend to advance the general knowledge of the utilization of gas in all its ramifications; and the Committee recommended the establishment of a central bureau for this purpose, with special reference to modern developments in the application of lighting.

INDUSTRIAL PROCESSES AND APPLIANCES USING GAS.

Much attention has been devoted to this branch of the gas sales department in the United States, and many new ideas brought out, the more important of which are presented in the following abstracts.

First may be noticed a series of articles based on practical experience, contributed to "Gas Record" by an industrial fuel expert, Mr. Edward F. Davis, who states that improvements in the service rendered, reductions in the selling price, and the large advance in convenience and efficiency of appliances have tended to rapidly increase and extend the industrial uses of gas. In England, Dr. Colman had advanced the opinion that the quantity of gas taken for such purposes would eventually equal, and perhaps exceed, the consumption for all other requirements; and it is many years since Sir William Siemens said that the time would come when the use of raw fuel would be simply barbarous, and that nothing except gas would be employed. Although great strides had been made in this direction, the possibilities of gas had not received so much serious thought and consideration as they deserved.

In the course of some notes on the history of the subject in England, he said that as early as 1806 Josiah Pemberton constructed a gas-stove for heating soldering irons at Birmingham, and a year earlier, R. Hicks took out a patent for heating baths by means of gas. Up to 1890, however, no convenient or economical water-heater was available, though since that date the instantaneous heater and other forms had been extensively de-

veloped. About 1840, a Scotch manufacturer named Macintosh made several tons of steel by submitting iron to the action of gas at a low red heat. In 1857, a patent was granted for heating laundry work; and in 1859 a soldering apparatus with foot bellows was described. Several gas industrial appliances were on view at the Paris Exhibition of 1867, and at the Royal Agricultural Exhibition, twelve years later, several forms of small gas-heated steam-boilers were to be seen. About the same time, the South Shields Gas Company exhibited over 300 appliances by which gas could be used for purposes other than lighting.

The possibilities of this large and almost unexplored line were only in their infancy; but it was apparent to gas men that it would be the field of the future, and as such should engage the serious attention of all who are interested in the sale of gas. The business that would follow an intelligent and energetic campaign could scarcely be estimated; but it would be largely influenced by the knowledge and efficiency of the salesmen concerned. In order not merely to get further business, but to retain that already in existence, either the most efficient applications of gas or special prices were necessary; and it was cheaper to meet competition with the best appliances at hand than to sell inferior apparatus that wasted the fuel, and perhaps eventually lost the customer. Although many manufacturers were using gas as an essential, frequently they did so in a very crude way; and apart from prospective usage of gas there was room for improved and more efficient apparatus for the work to which it was now being applied.

Although some attention had been directed to this point, anything approaching to a systematic handling of the business was still missing in many places. The commercial department was a comparatively new one in the gas industry, and had been chiefly directed to the gas-cooker and domestic consumption. But there was also lack of detailed information, and the local gas manager usually required assistance when industrial problems cropped up. Industrial usage not only meant large size burners, but frequently continuous running throughout the working hours, and for many reasons was more profitable than the same consumption divided over a number of domestic users. Yet few gas managers were inclined to incur an adequate expenditure, proportioned to the prospective consumption, for the proper cultivation of this line of business. The consumers must be educated up to the figuring-out in hard cash the value of the convenience, cleanliness, and adaptability of gas, in such a way that it would more than offset a higher cost per unit of heat. Herein lies the advantage of employing an experienced industrial fuel salesman, capable of exercising discretion in the selection of an appliance that would secure the highest possible efficiency for any prospect.

The three steps to be accomplished were to attract attention, create a desire, and carry conviction. The ordinary method of advertising, as applied to domestic consumption, did not attract the manufacturer. Photographs of the representative appliances as actually installed and in use in the district concerned, together with operating data, could be collected in book form for the use of salesmen, and a set of the photographs should also be conspicuously on view in the gas company's show-room. Single photographs with data pertaining thereto might be circulated by post-cards—care being exercised to see that each class of business gets its appropriate card. The booklets issued by the National Commercial Gas Association, under the title of "One Thousand Uses for Gas," furnished useful copy for special folders. These methods should be consistently and perseveringly followed up by personal applications.

There was a comparatively limited choice of appliances in connection with domestic selling; but the industrial salesman had to deal with hundreds of different uses, each requiring different treatment and attention, and should be able to put his case briefly but comprehensively. A great aid in closing a sale was an industrial show-room. A display in connection with domestic consumption was the usual thing; so why not one for industrial business, which represented larger returns on the expenditure. A line of standard appliances should be displayed in the show-room, with descriptive cards and arrangements for actual demonstration of the working. It would give the prospect a more solid impression as to getting his requirements suited than a lot of nerve combined with a bunch of catalogues; and he should be encouraged to bring his own material and work it up. The experience of others in the same line of work was valuable, because the customer would naturally be more interested in work actually accomplished than in calculations as to what might be done. But a manufacturer frequently objected to a competitor seeing how his work was done, or even that he was using gas. The industrial equipment should be suited to the size of the district, and the lines likely to be most in demand.

An industrial salesman should possess more than ordinary selling qualifications, have a wide mechanical and constructive knowledge, be versed in the various uses to which gas can be put and the methods of application, competent not only to discuss requirements, but also to actually demonstrate the suitability of the article recommended. The technical requirements of each trade and manufacture should be carefully studied; and in some cases special experiments may be advisable. He needed to be acquainted with the methods of fixing and operating every appliance on the market, and to know what to do in the event of a breakdown; and as he may expect to meet shrewd and keen principals or managers, he should be capable of making a favourable impression and securing attention. He will thus ensure at least a courteous welcome; but if he talked at random, the prospect might think that if the salesman did not know what he was talking about, there was not much merit in the article that he wanted to sell. He must also have some knowledge of competing fuels, such as coal, coke, or oil, and when and where gas can be successfully substituted, as certain classes of business rightly belong to gas, while others were more satisfactorily served by solid fuels.

It was not advisable to go too closely into bare comparative costs. For instance, it had been proved that if coke cost nothing, natural gas at 30 c. per 1000 c. ft. was cheaper for melting brass; the saving being on the labour, wear and tear, and reclaimed metal. A trial under working conditions was the entering wedge; and the salesman not only demonstrated in connection with a particular case, but at the same time obtained valuable general data relating to the work in hand, and the operating and other conditions pertaining to it. In most cases the advantages secured by gas included increased output and efficiency due to better heat control and no waiting for "heating up," cleanliness by the elimination of soot, smoke, and ashes, saving of both ground space and labour, rather than a lower fuel cost. Experimenting on the premises of the customer was not desirable, except under very special circumstances. If the confidence of the prospect was gained, the appliance was as good as sold; but otherwise the case was hopeless.

Taking as a basis for comparison of costs bituminous coal at 13,000 B.Th.U. per pound, and anthracite peas at 12,500, fuel oil at 140,000 B.Th.U. per gallon, and gasoline at 120,000, natural gas could be taken as 900 to 1000 B.Th.U. per cubic foot, oil gas as 850 to 900, coal gas as 650, coke-oven gas as 620, carburetted water gas as 575, blue water gas as 295, anthracite producer gas as 135 to 150, bituminous producer gas as 140 to 160, various other forms of producer gases at 140 to 175, and blast-furnace gas at 105.

The usual methods of employing gas for industrial purposes were the open flame and the atmospheric burner (with or without air-blast or high-pressure gas), artificial fuel beds, surface combustion, explosion as in the gas-engine, and in conjunction with oxygen. In the open burner, all the air for combustion was obtained at the surface of the flame, and therefore it was large. Although the average temperature was lower than that of a non-luminous flame, in a steady open flame there was a thin outer envelope in which combustion was practically completed, that developed, according to Professor Lewes, a temperature of 2119° C. The radiant heat was higher, being in the neighbourhood of 20 p. ct., whereas the atmospheric burner only realized 12 to 15 p. ct., and its average temperature had been fixed at 1704° C. If the flame was to be in close proximity to the work to be heated, the open flame was unsuitable, as its efficient operation depended on free contact throughout for the air necessary for complete combustion. If used in such circumstances there was a deposit of soot, which, as a non-conductor of heat, reduced the absorbing capacity of the surface to be heated. The open flame was therefore seldom applied to industrial uses.

In the atmospheric burner, the gas issued at a high velocity through a small orifice into an injecting tube, where it entrained, and mixed with, a quantity of air, which was called the primary air; and the object secured by the orifice was a proper supply of gas, according to the purpose required. A fixed orifice was a drilled hole of such size that its cross section would permit a fixed quantity of gas to pass at a constant pressure, and could be used if the supply pressure was uniform. But the adjustable orifice was generally preferred as a means of providing against variation in quality or pressure of gas. It usually consisted of an orifice large enough to pass the maximum amount of gas at minimum pressure, with a needle adjustment by which the aperture could be reduced to any degree up to complete closure.

If the pressure and specific gravity of the gas were known, the size of orifice required to pass a given quantity of gas could be calculated from the following formula:

$$Q = 3{\cdot}7\ D\ \frac{(P\ 460 - t)}{g\ B}$$

Q = quantity of air in cubic feet.
D = diameter of orifice in inches.
P = supply pressure in inches of water.
D = specific gravity of gas (air = 1).
t = temperature of gas in degrees Fahr.
B = absolute barometer pressure in inches of mercury.

The proportion of primary air required to produce a bunsen flame ranged from two to three times the volume of gas, according to the quality, which was about one-third of the amount required for complete combustion. At ordinary distributing pressures, it is not possible to entrain a larger proportion of air. The volume of air taken would depend on the back-pressure in the injector tube and the aggregate area of the outlet or outlets. If so arranged as to take a larger proportion, back-firing is the result, the velocity of combustion being greater than that of the mixture of gas and air travelling up to the burner; but the greater the amount of primary air that can be introduced without risk of back-firing, the smaller, and the more efficient, will be the flame.

(To be continued.)

CRACKING GAS-OILS IN VARIOUS ATMOSPHERES.

By R. C. DOWNING and E. F. POHLMAN.

[Extracts from a Paper presented at the Annual Meeting of the American Gas Institute.]

Among the papers presented in the Chemical Section, was "A Study in Gas Oils," by Messrs. Downing and Pohlman. This was divided into two parts—the first of which was noticed on p. 387 of the last volume of the "JOURNAL." The second part was an account of an investigation of the effect of various gaseous atmospheres upon the results of oil-cracking, which was undertaken with the object of determining the influence of each constituent of the blue gas upon the quality and quantity of the end products. In order to make comparisons, special care was taken to maintain the time of contact approximately the same with each gas used. The atmospheres used were nitrogen, carbon dioxide, carbon monoxide, hydrogen, methane, blue gas, and a mixture of blue gas with 10 and 20 per cent. of steam respectively. The carbon monoxide, hydrogen, and methane contained considerable amounts of impurities; but, on the whole, these impurities were probably not sufficient to obscure the main reactions and render the interpretation of results faulty. It was the purpose of the authors to consider the effect of each diluent on candle power, candles per gallon, B.Th.U. per gallon, and the production of gas, tar, and carbon. Much information concerning the probable cause of the cracking reaction can, they point out, be obtained from a study of the gas analysis and production of various constituents due to the oil—such as illuminants, hydrogen, methane, and ethane.

NITROGEN.

The tests were made in nitrogen to determine the effect of a neutral atmosphere. Since nitrogen is very inert, it is reasonably certain that no chemical decompositions other than those similar to the formation of straight oil gas will occur. At the same rate of oil introduction, the time of contact will be much less when a foreign gas accompanies the oil vapours through the machine. For example, when oil is introduced into the cracking zone at the rate of 5 cubic centimetres per minute, the time of contact will be about 16 seconds. When a carrier for the oil vapours is employed to make the proportion of oil gas in the finished gas about 30 per cent., the time of contact will be about 5 seconds. This will have a material effect upon results, and will be considered under the heading "Oil Only."

No candle-power results could be obtained when the oil was cracked in a nitrogen atmosphere, since the gas would not burn in the Bray burner.

The B.Th.U. obtained in the gas per gallon of oil were 97,000 at 1350° Fahr. This is slightly better than that produced in atmospheres of carbon monoxide, carbon dioxide, and methane, and lower than that produced in hydrogen and blue gas.

The weight of oil gas produced was rather low. This is to be expected, since a greater decomposition of the oil gas would take place due to the absence of an active agent to retard such decomposition or to cause hydrogenation.

The tar and carbon produced, on the other hand, was quite considerable. This is generally the case in inert atmospheres.

The volume of gas made at 1350° Fahr. was about 62 cubic feet per gallon of oil. It is to be noted also that the production of hydrogen at this temperature was 10·6 cubic feet; whereas when hydrogen is present in the surrounding atmosphere, a disappearance or absorption occurs.

OIL ONLY.

When oil is conducted into the cracking chamber, in the absence of any surrounding atmosphere, the effect of a longer time of contact and greater concentration of oil vapours can be clearly seen. The candle power cannot be read accurately on a Bray burner since the gas burns with a large smoky flame, and the maximum efficiency of the flame is not developed.

The B.Th.U. per gallon are very low. Only 80,000 B.Th.U. were obtained from the same oil which gave 97,000 when accompanied by nitrogen. This fact illustrates the tendency of the oil gas to decompose into simpler compounds and carbon. A much higher yield of oil gas is obtained by volume. This gas is largely methane. The weight of oil gas found is small, while the tar formation is exceedingly high.

A comparison of the results from cracking in the presence of nitrogen and cracking oil alone, shows that the illuminants are very easily decomposed, with the formation of methane. At the temperature of 1300° Fahr., the illuminants decreased in volume from 25 to 19 cubic feet, due to the increased time of exposure. If the illuminants are considered to be mostly ethylene, the reaction occurring may have been:

$$C_2H_4 = CH_4 + C_2.$$

This being true, we would expect an increase in methane, in the case of cracking the oil alone, by about 6 cubic feet. Ethane when present in a gas is equivalent to twice its volume of methane; and its probable decomposition to methane is affected by hydrogen, thus:

$$C_2H_6 + H_2 = 2CH_4.$$

Considering the volume of ethane as two volumes of methane, the increase in the methane content at longer time of contact is 7 cubic feet. The volume of hydrogen does not change.

Again, at 1350° Fahr., the decrease in illuminants is 9 cubic feet, while the increase in methane is about 8 cubic feet. This fact would seem to indicate that the reaction:

$$C_2H_4 = CH_4 + C_2$$

is the predominant one. Some condensation of the illuminants may, however, have occurred. The fact that there is little difference in the hydrogen contents indicates that the reaction:

$$CH_4 = C + 2H_2$$

does not occur to any extent at these temperatures, and under the conditions imposed.

CARBON DIOXIDE.

When the fires in the generator are in poor condition, large amounts of carbon dioxide will be produced. It is known that each per cent. of the carbon dioxide in the finished gas decreases the candle power by about 2 per cent. When the oil was decomposed in the presence of such a poor quality of blue gas, the loss in candle power was 5·5 per cent. for each per cent. difference in carbon dioxide in the finished gas, or 3·6 per cent. for each per cent. difference in carbon dioxide in the blue gas.

When an atmosphere of carbon dioxide alone was used, the candle power could not be measured with the Bray burner, because the gas would not burn when issuing from the jet. The B.Th.U. per gallon of 95,000 is less than that obtained with blue gas. The volume of the gas made was good, being over 60 cubic feet per gallon. This gas, however, was very light, containing much hydrogen and methane, so that the weight of gas produced from the oil was low.

The tar production was lower than that obtained with blue gas or hydrogen. The noticeable effect of carbon dioxide was the increased proportion of carbon. At 1350° Fahr., a yield of 25 per cent. was observed; while with blue gas the ordinary production is about 10 per cent.

CARBON MONOXIDE.

The cracking of oil in a carbon monoxide atmosphere gave rather surprising results. The great loss of candle power is noticeable. This is in accordance with the investigations of Dr. A. H. Elliott, on the "Effect of Diluents on Candle Power." * The candle power was low because of the effect of the large proportion of carbon monoxide in the finished gas; and it would necessarily follow that the "candles per gallon" results would also be inferior. The B.Th.U. results were the lowest obtained with any atmosphere, excepting, of course, oil acting alone with a much longer time of contact. The volume and weight of gas produced are good; being much better than the results with carbon dioxide or nitrogen.

Carbon monoxide appears to be a direct cause for the production of tar, since more tar was produced in this atmosphere than any other. The carbon depositions, on the other hand, are low. It also appears that the carbon monoxide is instrumental in preserving the illuminants from decomposition. Less hydrogen was generated in cracking the oil to carbon monoxide; and the yield of illuminants was good.

A theoretical consideration of the action of carbon monoxide and dioxide upon the preservation of the illuminants and hydrocarbons leads one to expect that the results should be similar to those actually obtained. For example, take the reaction:

$$C_2H_4 + 2CO_2 = 4CO + 2H_2.$$

The conditions of equilibrium are expressed by the equation;

$$K = \frac{p.CO^4 \times p.H_2^2}{p.C_2H_4 \times p.CO_2^2}$$

It is evident, since K, the equilibrium constant, has a definite value for each absolute temperature, and since the partial pressure of any constituent is proportional to its volume, that the conditions favourable to preserving or preventing decomposition of the ethylene will exist when the volumes of carbon monoxide and hydrogen are higher and the volume of carbon dioxide is low. Now, an examination of the results obtained at 1350° Fahr. shows that in carbon dioxide 28·2 cubic feet of illuminants were produced, while in carbon monoxide 30 cubic feet were made from 1 gallon of oil. Thus it will be seen that carbon monoxide does exert a preservative effect on the illuminants. It appears possible, also, that the carbon monoxide is instrumental in aiding the oils to decompose more extensively into high molecular weight olefines, which pass into the tar, and ethylene or propylene, which increases the percentage of illuminants in the gas.

The effect of mass action is also noticeable in the carbon monoxide atmosphere. The presence of large amounts of carbon monoxide results in a slight absorption of this gas. In other atmospheres, there was usually a small production of carbon monoxide. The probabilities are that carbon monoxide in solution in the water of the holder or meters is the contributing cause for this production. But it has also been demonstrated by Whitaker that cuprous chloride solution will absorb such paraffin hydrocarbons as ethane, propane, and butane. This absorption would be indicated as carbon monoxide in an analysis, and no doubt often accounts for the presence of carbon monoxide in the gas made. When an atmosphere of carbon dioxide was used, however, some of the carbon dioxide was decomposed; for an absorption of

* See "JOURNAL," Vol. CXX., p. 442.

4 cubic feet per gallon of oil was noticed. This absorption was accompanied by a production of 3·4 cubic feet of carbon monoxide, which is in accordance with the equation cited.

There are usually so many reactions taking place, and so many equilibrium conditions to be considered, in connection with oil decomposition, that it is almost impossible to predict just what the ultimate outcome will be; whereas if only one reaction were to be considered, it would be a comparatively easy matter.

HYDROGEN.

The action of hydrogen is the most interesting of all the gases examined. It was expected that candle-power and candles per gallon results would be high. As a matter of fact, these results were lower than those obtained in an atmosphere of blue gas containing about 50 per cent. of hydrogen. The volume of gas made is high. This is an indication that absorptions have taken place. From one of the charts, it is seen that an absorption of hydrogen has actually occurred amounting to as high as 20 cubic feet per gallon of oil. This absorption has resulted in the formation of saturated compounds, such as ethane and methane. It is of interest to note that at 1300° Fahr., 19 cubic feet of ethane were formed per gallon of oil, and only 1·3 cubic feet of methane. As the temperature increases, the ethane decomposes, and methane is formed; so that at 1400° Fahr. the production of ethane is 9 cubic feet, and that of methane 37 cubic feet. At higher temperatures, the ethane would be entirely decomposed.

The production of illuminants is low. Apparently some of the unsaturated compounds have been hydrogenated, forming saturateds. The reactions occurring are probably:

$$C_2H_4 + H_2 = C_2H_6,$$
$$C_2H_4 + 2H_2 = 2CH_4,$$

the latter occurring at high temperatures, the former at lower ones.

The illuminants have approximately the same photometric value as those produced in atmospheres of blue gas. The heating value of the illuminants is slightly lower. This would seem to indicate that hydrogenation of the other olefines, such as propylene and butylene, occurs first, and that ethylene is more stable, being able to withstand decomposition. Further evidence tending to establish this theory is the fact that the specific gravity of the illuminants produced is lower, and very close to that of propylene. Since all the errors of the analysis enter into this calculation, it is probable that the results are a trifle low.

Hydrogen has an influence in producing high B.Th.U. gas, because of the great production of saturated compounds. The decrease in the volume of gas made is the reason that the B.Th.U. per gallon are not higher. Again, when excessive amounts of hydrogen are present, the tar production is lowered, and also the amount of carbon deposited. The decrease in tar formation is probably caused by greater hydrogenation of the lighter olefine compounds which ordinarily would have passed into the tar.

METHANE.

When the oil was cracked in an atmosphere of methane, the best candle-power results were obtained. This may he due to the fact that methane itself possesses a candle power of 4·5 when burned at the rate of 5 cubic feet per hour. The volume of gas made compares favourably where no absorption occurred. Hence the candles per gallon figures are also good.

As a whole, methane acts very much like an inert atmosphere, such as nitrogen or carbon monoxide, since the weight of tar and carbon produced is quite large. Much less methane was produced from the oil when the methane was already in the surrounding atmosphere. On the other hand, the production of hydrogen is larger, an indication that the reaction:

$$CH_4 = C + 2H_2$$

is occurring more extensively than in other atmospheres.

The effect of methane on the illuminants is also probably preservative, since the presence of this gas introduces equilibrium conditions which prevent the hydrogenation of the unsaturated compounds.

BLUE GAS.

A comparison of the action of the various atmospheres discussed with that of blue gas, leads one to the conclusion that no advantage is to be gained over blue gas by the use of any of these atmospheres alone. It would not be beneficial to pass a scrubbed coal or oven gas through the carburettor or superheater while enriching with oil, neither would a natural gas used in such a manner add enough gain in the efficiency of oil-cracking to offset the cost of such a procedure.

It is of much interest to note that blue gas, when used, gave much better candle-power results than either hydrogen or carbon monoxide alone. The lower proportions of carbon monoxide in the finished gas greatly diminish the deleterious influence of that constituent on candle power, while the smaller proportion of hydrogen present decreases the loss of volume due to absorptions. The tar formation is lowered, and carbon depositions are medium. The B.Th.U. results are also the greater than those obtained in any single atmosphere.

It is rather difficult to trace the reactions which have occurred in the carburetting of water gas. Charts submitted to indicate the general tendency of decomposition—viz., the effect of increasing temperatures and also of increased times of contact on the production of the various constituents—show that the illuminants formed from a gallon of oil gradually increase, and reach a maximum at about 1300° or 1350° Fahr. Higher temperatures cause the decomposition of these illuminants.

It is generally conceded by all authorities that, when an oil dissociates, the primary products are the higher molecular weight olefines and lower molecular weight paraffines. Further decomposition results in the production of carbon and hydrogen. For example, we may assume decane ($C_{10}H_{22}$) to decompose as follows:

$$C_{10}H_{22} \rightleftharpoons C_9H_{18} + CH_4$$
$$C_9H_{18} + H_2 \rightleftharpoons C_9H_{20}$$
$$C_9H_{20} \rightleftharpoons C_8H_{16} + CH_4$$

or in general—

$$C_nH_{2n+2} \rightleftharpoons C_{n-1}H_{2n-2} + CH_4$$
Paraffin = Olefine + Paraffin
$$C_{n-1}H_{2n-2} + H_2 \rightleftharpoons C_{n-1}H_{2n}$$
Olefine + Hydrogen = Paraffin
$$C_{n-1}H_{2n} \rightleftharpoons C_{n-2}H_{2n-4} + CH_4$$
Paraffin = Olefine + Paraffin

A consideration of the results, will show that this reaction has taken place extensively. The illuminants which consist mostly of ethylene are hydrogenated, forming methane and some ethane. The longer the vapours are acted upon, the greater is the proportion of methane produced and the hydrogen absorbed; while the illuminants decrease. On the other hand, such reactions as:

$$CH_4 = C + 2H_2$$

did not occur to a marked extent, since if this had happened one would expect an increase in the hydrogen present in this oil gas. The volume of hydrogen formed should have been noticeable; whereas there was always an absorption. Extremely high temperatures, however, favour the latter reactions.

From the work with blue gas, it is difficult to state whether oil decomposes with formation of hydrogen. This is probable; but the amount present in the finished gas is usually less than that in the blue gas. At temperatures above 1500° Fahr., the reverse has been noted, and is probably due to the decomposition of methane to carbon and hydrogen. Hydrogen absorption varies from 6 to 10 cubic feet at the usual temperatures of operation.

As has been already noted, methane is the main primary decomposition product of the oil formed by hydrogenation of olefines. It gradually increases until temperatures above 1600° are reached. Ethane is also a primary decomposition product; but we rarely obtained more than 5 cubic feet per gallon. The usual temperature of formation was from 1250° to 1350°. At 1400° Fahr. the ethane has all decomposed, probably according to the reaction:

$$C_2H_6 + H_2 = 2CH_4.$$

The disappearance of the ethane is usually accompanied by a large increase in the methane content. The reactions:

$$C_2H_6 = C_2H_4 + H_2 \quad \text{and} \quad C_2H_6 = C_2H_2 + 2H_2$$

do not occur extensively, as some have believed; since, if this were true, one would expect a larger increase in illuminants and hydrogen than was actually found. These reactions do occur to some extent at higher temperatures and longer times of contact than are usual in operating practice. As a matter of fact, increasing times of contact result in greater hydrogen absorptions and a decrease in illuminants. This indicates that the conditions are not suitable to ethylene formation.

EFFECT OF STEAM.

Steam is always present in the blue gases passing through the carburettor and superheater, more especially at the end of the run. The steam exerts a detrimental effect on candle power and candles per gallon results. The B.Th.U. per gallon of oil produced are high. This may be due to a partial decomposition of the steam into hydrogen, since the weight and volume of oil gas produced are greater than in blue gas without steam. Steam also gave lower yields of tar and larger carbon depositions. Much reliance cannot be placed on these figures, however, since the weight of water used was deducted from the total weight of tar and water condensed. Irregularities in the drawing of the tar greatly affect the results. Also some decompositions of the steam occurred.

A consideration of the theoretical equation:

$$C_2H_4 + 2H_2O = 2CO + 4H_2$$

and the equilibrium conditions connected with it, leads one to expect that an excess of steam would cause a decomposition of hydrocarbons. This has been the case. At 1300° Fahr., about 30 cubic feet of illuminants were produced in the dry blue gas. The same temperature with finished gas containing 10 per cent. of steam yielded only 27·4 cubic feet of illuminants. When 20 per cent. of steam admixed with blue gas was used, 28·2 cubic feet of illuminants were produced.

The higher percentage of steam also seemed to allow the maximum production of illuminants to occur at a slightly higher temperature. The ethane did not dissociate so rapidly when more water vapour was present. Apparently, the presence of excess steam is not injurious to the operation of a water-gas set from a B.Th.U. standpoint; but it is decidedly so from a photometric point of view. Besides, the presence of much steam is an indication of poor blue gas and longer times of contact, all of which are very injurious to good operating results.

APPEARANCE OF FLAMES.

The appearance of the flames when the gas formed in the

various atmospheres was burned in a Bray burner is, no doubt, of interest. Carbon monoxide causes the flame to be small, and very bright. Hydrogen causes the flame to be large and unsteady, but not very brilliant. Methane gave a very large flame, but rather deceiving, as the candle power was not as high as might be expected from casual observance. No appreciable difference could be noticed in the burning of the blue gas-oil gas flame from that of blue gas steam-oil gas.

TRANSFORMATION OF AMMONIA TO NITRIC ACID.

The subject of "Nitrogen and Nitrates from Bituminous Coal" was discussed by Mr. C. J. Atwater, in a paper he read before the American Chemical Society. The oxidation of ammonia to nitric acid is, he said, practically a new process in that country. Commercially, its prospects seem to offer little attraction, as the ordinary method of producing nitric acid by treating sodium nitrate with sulphuric acid is a less expensive one. Its principal function would be in time of war, when sodium nitrate would possibly not be obtainable. As the great resource of America for combined nitrogen lies in the recovery of ammonia from bituminous coal, the adaptability of this form of ammonia to oxidation by the Ostwald or some other process is most important. The Ostwald process, as is well known, depends upon the action of a catalyst on a mixture of ammonia and air, or air and oxygen; such catalytic action being more or less subject to derangement or poisoning by certain impurities. Granted that the Ostwald process is capable of producing nitric acid from ammonia in large quantities which, in view of the present European experience, may safely be assumed—the question resolves itself into an investigation of the effect of the impurities and the process of their removal if necessary. That the impurities in coke-oven ammonia can be successfully removed so as to deliver a gas that is to all intents and purposes pure, has been amply demonstrated. This is regularly done in the manufacture of anhydrous ammonia, aqua ammonia, and ammonia for the production of pure ammonium salts. The methods employed it is probably possible to modify for the purification of ammonia for oxidation on a scale of (say) 100 tons per day, at reasonable cost; and what modifications, if any, are permissible in order to lessen this cost, without interfering with the practical operation of the catalyst, is a question that can be solved only by diligent experimentation on a laboratory and on a factory scale. In addition to the successful work which has unquestionably been done abroad, such investigations have been recently undertaken by several different agencies in America; and considerable progress has been made. One source of unquestioned authority states that independent laboratory investigations have definitely shown that we can purify coke-oven ammonia on a commercial scale quite well enough to permit satisfactory oxidation to nitric acid. The expense of purification is well within reasonable limits; and the experiments indicate no practical obstacle to the use of coke-oven ammonia for nitric acid manufacture.

Coal Standard Price.—The Board of Trade have received an application from the owners of certain collieries in Northumberland for an increase in the standard amount under the Price of Coal (Limitation) Act, 1915. The application relates to such of the smaller owners in the district as have not a large share of the shipment trade or have lost more than a certain proportion of their men since the war.

Fatal Gas Burning Accident.—A verdict of "Accidental death" was returned at an inquest in Dublin on Emily Noble, aged 20, who died from shock and burns sustained in a shell factory. The Matron at the factory said she was sitting at a gas-stove, when Noble approached and asked her to remove a small piece of metal which had got into one of her fingers. She was in the act of doing so, when deceased gave a jump and fell towards the stove, her clothes becoming ignited. The stove was an open one; and at the time of the occurrence there was no guard upon it.

Westbury Gas and Coke Company.—In the course of some remarks to the shareholders at the annual meeting of the Company, Mr. N. H. Humphrys (the Managing-Director) referred to the fact that gas companies are sometimes supposed to be realizing substantial profits by the extraction of toluol from the gas, and said the receipts from tar (toluol included) had been less than was formerly the case from crude tar. The Company were by no means exceptional in having experienced a decrease in the sale of gas, in consequence of the war. Dividends were declared for the six months ended Sept. 30 at the rate of 6 p.ct. per annum on the original and 4½ p.ct. on the new shares.

Wages at Stockton-on-Tees.—Criticism of the Stockton-on-Tees Gas Committee was made at a meeting of the employees last week, when Mr. H. Lynass (the Union District Secretary) reported on the progress of negotiations relative to an application for an advance of wages of 5s. per week. The application, he said, was made on Sept. 27; and up to the present no definite reply had been received. As the works came under the Munitions Act, he had made application to the Board of Trade to appoint an Arbitrator; but so far this had not been done. This delay could only be due to opposition to arbitration on the part of the Committee. The Act specified that, unless an Arbitrator was appointed within 21 days of the application, men were free to cease work, if they desired, without further notice. The meeting resolved to request the Executive Committee to grant permission to render notices.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Oil-Washing of Gas.

SIR,—Reading the "Editorial" in your last issue, I notice that, in connection with the work of promoting the oil-washing of gas, you mention the names of many men who have taken a more or less prominent part in this direction. Have you not, however, entirely ignored the names of those men who have taken, and are taking, by far the most important place in developing the recovery of benzol and toluol at gas-works in this country. Was it not Dr. W. B. Davidson who first suggested to the War Office that this work should be carried out, and were not the initial experiments done under his direction as long ago as 1914, as a result of which a plant was erected and set to work at the beginning of 1915 on the Birmingham works of which he was then the Engineer?

Again, I would have thought that at the present time the name of Captain R. S. Hilton would have "readily come to mind," because I understand that during the past two years he has been responsible for the erection and setting to work of not only the first, but of every large plant which the Ministry of Munitions has installed on gas-works, and at the present time has each one of these under his direct control.

Dec. 29, 1916. ENGINEER.

[Our correspondent will observe that the "Retrospect" in last week's issue is headed "1916." In the "Retrospect" for 1915, allusion was made to the (for the gas industry) pioneer work of Dr. W. B. Davidson in connection with the oil-washing of gas; and reference was also made to the work of another old Birmingham man, Dr. Harold G. Colman. Dr. Davidson transferred his services in 1915 to British Dyes Ltd.; and this fact was also recorded in the "Retrospect" of a year ago. The names that, in writing of the affairs of 1916, readily came to mind were those of men who had been, through papers and articles, prominently at work in the industry during the year stimulating the adoption of the oil-washing process. We freely admit an oversight in not mentioning the name of Captain R. S. Hilton, who has been so unostentatiously doing valuable work for the Explosives Department of the Ministry of Munitions in the erection of large oil-washing plants upon gas-works. We remember, too, before gas-works actively and generally entered into this particular service for the country, Captain Hilton's assistance to the "cause" through the encouraging speeches that he made at certain meetings of gas men. In regard to the omission of his name, it is unnecessary to assure those connected with the Birmingham Corporation Gas Department that no slight was intended to it, or to anyone associated with it. We have too great an admiration for the work of the Birmingham Gas Department and for its men to permit us to intentionally overlook it or them. Without reference, we remember noticing in the "Retrospect" last week the technical work that is being done by the Department in developing the sale of gas for manufacturing purposes; under the cross-heading "The Works and the Distribution System" an allusion appeared to Birmingham vertical retort experiences; and elsewhere the name of the respected Chairman, Sir Hallewell Rogers, was mentioned. Of course, in a few columns, the whole of the events and facts relating to the year cannot be brought into view; and there are, with such a large field from which to gather, sure to occur some regrettable omissions.—ED. "G.J."]

Sulphate of Ammonia Prices.

SIR,—The world-wide recognition of the accuracy of the "JOURNAL" has led to numerous and important contracts for residual products being based upon your market reports. For many years the results have been satisfactory to both buyers and sellers; and we have for nearly forty years based numerous contracts on these reports. But I venture to suggest that your recent reports of the sulphate of ammonia market have failed to maintain this excellent standard; and I trust you will permit me to point out in what direction your records have misrepresented the prices of this important commodity.

In the late summer, an arrangement was concluded between the Government and the Sulphate of Ammonia Association, by which a sufficient quantity of this product was to be supplied to home agriculture at £15 per ton in the months of August and September and at £15 10s. from October, 1916, to May, 1917. The percentage of the total make was not a fixed quantity, but was to be sufficient to meet all agricultural needs. The balance only was to receive permits for exportation. This Company, in accordance with this arrangement, bought in August and September 660 tons, and since that date 1130 tons. Last week we bought through the Sulphate of Ammonia Association 100 tons at £15 per ton for 24½ p.ct. and £15 10s. for 25 p.ct. quality. In their last "Journal," the Board of Agriculture and Fisheries issued their price list of fertilizers which they recognize; and in this list the nitrogen in sulphate of ammonia is recorded as 15s. 4½d. per unit at: London, King's Lynn, Hull, Newcastle, Silloth, Liverpool, Widnes, Newport, Bristol, Plymouth, which for 24½ p.ct. quality is equal to £15 10s. per ton; and at Leith at 15s. 6d. per unit, which is equal to £15 12s. 6d. per ton.

Each month the Board of Agriculture requires every maker of sulphate of ammonia in the country to report the number of tons made and the tonnage sold, with the price, and whether for home consump-

tion or for export. Thus the Board of Agriculture has definite returns on which to base its reports of prices. As manufacturers of sulphate of ammonia, we have to make these monthly returns; and, as our sales are limited to farming uses, our price has been for the last three months uniformly £15 10s.

I beg to call your attention to the fact that this recognition of the agricultural demand by the Government is noted by all chemical journals. Thus the "Journal of Chemical Industry" gives weekly a review of the market movement, referring pointedly to the agricultural prices. The "Daily Commercial Record" also gives the home agricultural prices arranged by the Government, and also notifies that the export prices recorded are subject to a discount of 3½ p.ct. This is, of course, an important item to both buyer and seller in the case of a high-priced article like sulphate of ammonia.

I trust under these circumstances that you may deem it advisable for the benefit of your many readers in the chemical trade to record weekly both the home agricultural price and the price for export.

If it would be of service to you, we are prepared to inform you regularly of both our purchases and sales.

H. C. BROWN.
West Norfolk Farmers' Manure and Chemical Company, Limited,

King's Lynn, Dec. 27, 1916.

P.S.—In "The Times" to-day we notice that it is stated: "It is believed that the Board of Agriculture have resolved rigidly to prohibit the export of sulphate of ammonia."

[Apparently all our correspondent says is quite correct. It did not, however, appear to us to be necessary to repeat in our reports on the value of sulphate of ammonia the prices for home agriculture which had been fixed about July last for the whole season, as the trade was thoroughly familiar with the arrangement made between the Sulphate of Ammonia Association and the Board of Agriculture. In the same way, we do not go on repeating the values of benzené, toluol, and carbolic acid, because the prices are fixed by the Government. We have referred from time to time incidentally to the fixed arrangement regarding the home trade. Of course, the principal London makes of sulphate are sold for net cash. Though there would not be any objection to state in future the Government prices for the home agricultural interest, and a separate price for export (which is at present the only fluctuating price), it is well to bear in mind that it is only during the present abnormal conditions occasioned by the war that there have been different prices for the home trade and for export. In normal times, the prices are identical, both for export and the home trade. The export of quantities is now permitted only to an extent in excess of the home agricultural requirements, so far as these can be foreseen, together with the quantity needed for munition purposes.—ED. "G.J."]

More Postulation from Mr. Nobbs.

SIR,—Referring to the remarks made in the Dec. 26 issue of the "JOURNAL" upon my letter of Dec. 12, may I be permitted to reply to the writer of "Electricity Supply Memoranda," who apparently takes me to task for not giving him data upon laboratory tests of gas-ovens? "E. S. M.," in his anxiety to "dispute" that the "meat" losses in gas-ovens are not so great as is accepted by cooks and caterers, and proved in ordinary everyday practice, assumes that I have not tried a gas-oven and an electric oven by cooking two identical joints at equal temperatures. He asks us to doubt the experience of cooks and caterers in ordinary everyday practice, and the formulæ of cookery schools and cookery books as being unreliable—presumably "mere scraps of paper."

I did not limit my reference to the latter, and (as "E. S. M." states) "take refuge behind others." I preferred for the purpose of my short lecture and in my reply to "E. S. M." to quote what I consider a most essential point—viz., the experience of "ordinary everyday practice (not laboratory tests) with gas and coal ovens, compared with an electric oven. The small loss of meat in the latter was demonstrated in front of the audience under the worst conditions that could apply in "everyday practice"—*i.e.*, quick roasting at high temperature by a cook who had no previous knowledge of any electric oven, except for one trial run to test the temperature.

It will interest your readers to learn that apart from the small "loss of meat," some 11¾ p.ct. (5 p.ct. loss is obtainable with care and low-temperature cooking), the electricity consumed in cooking for the whole menu, including the boiling of vegetables, grilling, roasting, and baking, cost 5d., at 1d. per unit. The menu comprised: A 6s. joint of roast beef; roast chicken, 3s. 9d.; three filleted soles with sauce; twelve grilled cutlets and tomatoes; boiled peas and potatoes; apple tart; about a hundred fancy cakes and pastries; and two dozen shortbread fingers. The saving in the weight of the joint was sufficient to pay for the electricity consumed in cooking the above menu twice over.

If "E. S. M." will reread my letter of Dec. 12, he will discover a complete reply to the veiled suggestions one can read between his questions. But apparently it is not quite the reply that "E. S. M." would wish to conjure with; so "E. S. M." has recourse to a gentle verbiage upon the losses of meat in gas-ovens carried presumably by way of gaseous vapours through gas-oven ventilators, to form ether in the atmosphere.

Among suggestions that I "take refuge behind others," "E. S. M." credits me with quoting "others." I would refer him to the second paragraph in my reply of Dec. 12, and would add that "E. S. M." misses the point. We are not making laboratory tests that are seldom obtained in ordinary everyday practice in the home. "E. S. M." appears to avoid this essential factor, "the human factor," inasmuch as he asks me to take part in a public demonstration specially prepared, no doubt, by able assistants, in much the same manner as a conjurer would do when soliciting the assistance of an innocent member of his audience to witness his tricks, and meantime provide additional amusement for the audience.

Personally, I have no desire to participate in such a performance. I happen to have served most of my time (twenty years) with an old firm of gas engineers, and am therefore well versed in the manufacture and installation of gas-cooking appliances and possibly some of the "tricks of the trade."

A test made by myself with joints of beef of equal weight before cooking—one cooked in a gas-oven (double-cased type) and the other one in an electric oven, the average temperature in each oven being alike—gave a loss of approximately 20 p.ct. for the gas-cooked joint as compared with 11 p.ct. for the electrically roasted joint.

Gas consumed at 2s. 6d. per 1000 c.ft. and electrical energy at 1d. per unit, equalled a cost of 1·4d. and 1·75d. respectively. But, of course, the wide difference in the loss of meat in favour of the electric oven made the gas cooking much more costly. The electrical energy consumed would be paid for many times over by the saving.

Falkirk, Dec. 26, 1916. C. GEO. NOBBS.

[It is really unnecessary to reply to the foregoing letter; but a few remarks may be made upon it. The writer of "Electricity Supply Memoranda" did not ask for data from a laboratory test, but for data from a common-sense test conducted with a gas-oven and an electric-oven on terms of equality in regard to temperature and work done. We repeat that, according to the report of his lecture, Mr. Nobbs "took refuge behind others" in attributing certain losses of "meat" to gas operation. Now he takes refuge behind that convenient term the "human factor," which is an admission that with the gas-oven, as with the electric-oven, ordinary care and negligence have their parts in the results obtained. He does not tell us why with *equal* temperatures, and other conditions being uniform, there should be discordant results as between an oven gas heated and one electrically heated. But the best comment on Mr. Nobbs' letter is supplied by his refusal to support his own assertions and tests by an open competition—not in a laboratory. If he is as confident as suggested by his letter, then why not have the manliness to accept a challenge, and demonstrate beyond all dispute the inferiority of the gas-cooker. If he likes, the demonstration could be carried to the cooking of a three or four course dinner, including the boiling of vegetables and the water for "washing-up." Does Mr. Nobbs still decline a fine opportunity to add lustre to his name in the electricity supply industry?—ED. "G.J."]

A Sequel to Dark Streets at Henley.—The following appeared in "The Times" last Saturday: The Henley-on-Thames Town Council have for some months past refused to have any public lamps lighted in the streets, despite several protests. Recently, however, the Chairman of the Lighting Committee, while walking along a dark street, was knocked down by a cyclist, and rather severely injured. The Council have now agreed to allow one-fourth of the street-lamps to be lighted.

Coke Fire at Old Kent Road.—Some coke which had been insufficiently quenched at the Old Kent Road works of the South Metropolitan Gas Company recently caught fire; and it was not until the London Fire Brigade, with one of their floats, arrived on the scene that the fire was prevented from spreading to an adjoining coke-heap. A few hours after the float had got to work, the fire was extinguished. Altogether about 300 tons of coke were burnt; but in other respects no material damage was done.

Proposed Toluol Plant for Sidmouth.—At a meeting of the Sidmouth Urban Council last Wednesday, the Gas Committee reported having considered plans for the laying down of new plant for the purpose of extracting toluol and benzol at the gas-works, with rough estimates of the probable cost. They have instructed Mr. H. Burgess (the Gas Manager) to take the necessary steps with a view to ascertaining whether the Local Government Board will sanction an estimated required loan of £415. The report was adopted.

Lurgan Gas Profits and Income-Tax.—At a meeting of the Lurgan Urban District Council, the Clerk reported, in regard to the claim for income-tax on the profits of the gas undertaking, based on the profits of the last year in which it was controlled by the Gas Company, that he and the Manager had appeared before the Income-Tax Commissioners. It had been decided, in view of the fact that the Council were in possession for only a short period, that a revised account be made out—the matter to be finally dealt with at the end of the financial year. The sum involved is over £700.

Calorific Standard Applications.—At the last meeting of the Ilford Council, the Clerk submitted the draft Order of the Board of Trade under the Gas (Standard of Calorific Power) Act. It was reported that the draft met the objections raised on behalf of the Council; but the Clerk was instructed to intimate to the Board that the Council are of opinion that some protection should be afforded to the public regarding the enforcement of the standard of calorific power, upon cessation of the requirements of the Ministry of Munitions so far as concerns gas undertakings. The Eastbourne Electricity Committee have received a letter from the Town Clerk of Hastings stating that the Gas Company supplying the borough had applied for an Order substituting for the prescribed standard of illuminating power a standard of calorific power of 500 B.Th.U. gross, and that the Hastings Town Council were lodging a formal objection to it. As many local authorities were likely to be affected sooner or later, they felt that, if joint action could be taken, and the best available evidence placed before the Board of Trade upon one application, several smaller oppositions might be saved. They therefore inquired if the Eastbourne Corporation were sufficiently interested to join with others in the present opposition.

REGISTER OF PATENTS.

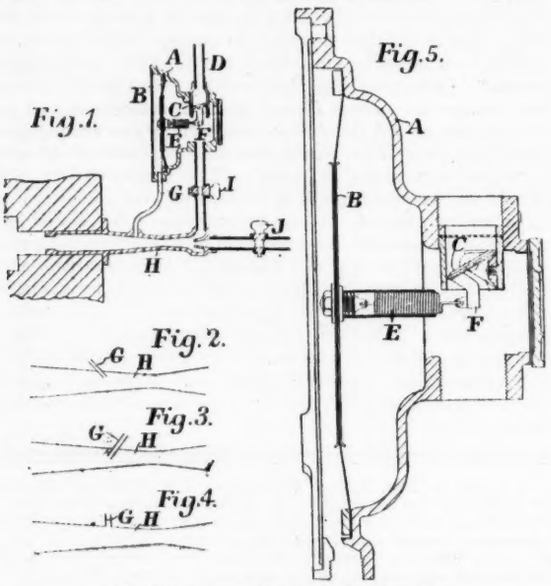
Firing Gas-Furnaces.

KEITH, J. & G., of Farringdon Avenue, E.C.

No. 16,711; Nov. 26, 1915. No. 18,072; Dec. 28, 1915. No. 3181; March 2, 1916. No. 6898; May 15, 1916.

This invention relates to apparatus for delivering a mixture of gas and air for combustion (say) in a gas-fired furnace, oven, or other installation; its primary object being to "render practicable the maintenance of the correct proportions of gas and air irrespective of variations in the quantity of the mixture being dealt with."

The method "consists, broadly, in injecting one of the constituents of the mixture and inducing the flow of the other constituent, while governing the pressure of the induced constituent in dependence on the resistance offered to the flow of the mixture, whereby variation in the resistance of the nozzle of the furnace or the like being fired, or of the flue, may be automatically compensated for—it being understood that variation in the quality of the mixture must otherwise result from variation in the resistance to be overcome."



Keith's Appliances for Firing Gas-Furnaces.

Fig. 1 is a vertical section showing the diaphragm casing and injector with a connection from the back of the diaphragm to a point on the delivery side of the injector. Figs. 2, 3, and 4 represent diagrammatically three forms of connection. Fig. 5 is a vertical section through the diaphragm casing. In the construction shown, the governor is designed to govern the pressure of gas—gas being the induced medium, and the injected medium being air. By a modification the governing device may be adapted to govern the pressure of the air where the induced medium is air and the injected medium is gas.

A is the diaphragm casing, in which is fitted a thin membrane B (in a vertical plane to eliminate the effect of weight) operatively connected with a valve C—preferably a balanced butterfly valve of elliptical shape. It forms a practically gas-tight closure when seated on the machined surface of the cylindrical valve casing in communication with the gas inlet. The valve is so mounted as to be immovable laterally; being carried by a hinge pin passing through lugs on a bracket within the casing. The membrane is operatively connected with the valve by a closely wound helical spring E, one end of which is connected to the membrane and the other end to the lever F. The connection between the back of the diaphragm and the injector is represented by a tube G, which is led to the expansion tube H of the Venturi tube, and terminates flush with the internal wall of the Venturi tube with its mouth facing "across-stream," as in figs. 1 and 4, or facing "up-stream," as in fig. 2, or "down-stream," as in fig. 3, according as it is intended to establish pressure above or below that of the mixture in the expansion tube. Whichever arrangement is adopted, increase or decrease of the resistance offered to the flow is instantaneously responded to by the governor; the consequential alteration of the pressure of the gas supply to the injector resulting in maintenance of the uniform quality of the mixture.

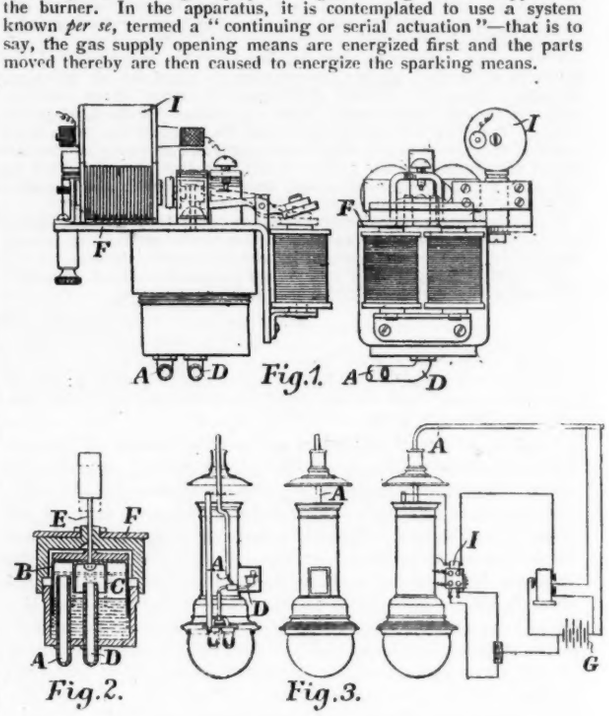
To effect the initial adjustment of the proportions of gas and air, or to effect a variation in the adjustment, a cock I is fitted in the connection for delivering gas from the diaphragm casing to the injector. The cock J serves to regulate the supply of air to the injector.

Lighting and Extinguishing Gas-Lamps.

SWANSTON, F. J., of Christchurch, New Zealand.

No. 16,097; Nov. 15, 1915. Convention date, Oct. 2, 1915.

This electrical device for lighting and extinguishing gas-lamps is of the type wherein a gas-valve is moved into or out of a mercury seal to respectively cut off or open the supply of gas to the burner—sparking means being employed to ignite the gas when supplied to the burner. In the apparatus, it is contemplated to use a system known *per se*, termed a "continuing or serial actuation"—that is to say, the gas supply opening means are energized first and the parts moved thereby are then caused to energize the sparking means.



Swanston's Lighter and Extinguisher for Gas-Lamps.

Fig. 1 shows a side and front end elevation of the electric apparatus employed. Fig. 2 is a sectional elevation through a valve to be described. Fig. 3 shows a side sectional elevation and a front elevation of a lamp fitted with the invention; also, a diagrammatic view of the electric wiring required.

The gas supply main A enters a vessel adapted to hold mercury and covered by a cap. A bell B has its rim always submerged in the mercury; and a smaller bell C, inside the other one, covers the mouth of a pipe D leading to the burner of the gas-lamp. The bells are adapted to rise and fall, so that when the rim of the bell C dips into the mercury, it is sealed, and gas cannot pass into the pipe D; but when the rim is raised above the mercury, gas freely passes to the lamp—the mercury then forming a seal to the bell B only. A rod E, secured to the bells, passes through the cap and is provided with a weight, or a spring could be used instead.

A base-plate F fixed to the gas inlet valve has a bracket whereon electric coils are mounted; while a lever pivoted by a pin in a bracket fixed to the base-plate has at one end an armature adapted to be attracted by the coils. The other end of the lever passes beneath the weight on the rod E, and is adapted to lift it and the bells when the armature is attracted by the coils. Other coils mounted on the base-plate F are adapted to attract another armature mounted on a spring, which presses it in the direction of the weight, so that when the weight is raised a nib on the armature passes below and keeps the weight in its raised position. The bells are thereby also raised; so that gas can pass freely from the main A to the pipe D, so long as the nib keeps the weight raised.

The whole of the electrical apparatus described is contained in a case fixed to the gas-lamp or near to it. The press button for lighting the gas and the button for extinguishing it have a common terminal plate connected by a wire to the battery G.

Upon one of the buttons being pressed, one circuit of the battery is closed; the coils are energized; and the armature H attracted, and the lever attached to it raises the bells B C. Gas then flows freely to the burner of the lamp. The pressing of the button referred to above closes the low-tension circuit of the transformer I, the high-tension circuit of which causes a spark to be given off by a sparking plug, the terminals of which are in close proximity to the burner of the lamp and lights the gas by means of their spark. The pressing of a second button closes the circuit of the coils, which then attract the armature and withdraw the nib, thereby allowing the bells to fall by gravity and extinguish the light by stopping the flow of gas.

Manipulating Mechanism for Coal Gas Generating Apparatus.

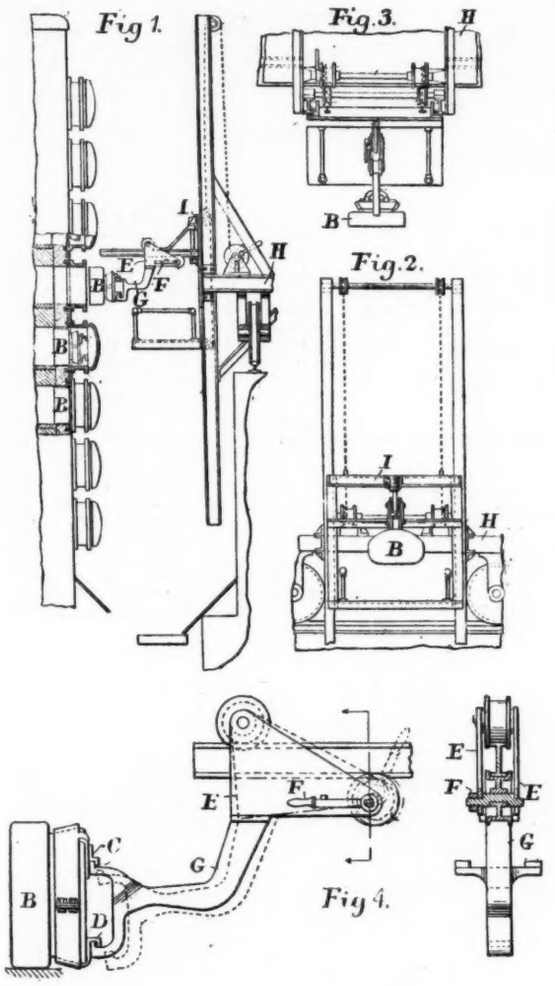
WHITE, A. E.; a communication from the Riter-Conley Manufacturing Company, of Leetsdale, Penn., U.S.A.

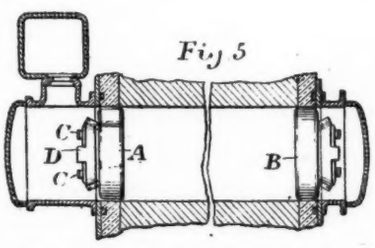
No. 16,526; Nov. 23, 1915.

This invention relates to apparatus for closing retort ends by plugs "to confine the heat within the retort and to prevent losses by radiation through the mouthpieces." The object aimed at is to provide quickly-adjusted and rapidly-operating manipulating mechanism.

In accordance with the one feature of the invention, the plugs are withdrawn and replaced by a common manipulator provided with

mechanism operable to move the manipulator in both a vertical and a horizontal direction to position the manipulator selectively relative to the retort mouth, and independent mechanism whereby the manipulator may be made to engage the selected retort plug, and then move it out of the way to permit of discharging or recharging the retorts. In accordance with a further feature, the mechanism which causes the manipulator to engage the plugs and withdraw the plugs, also moves the plug out of alignment, and *vice versâ*. In practice, this movement out of alignment is preferably effected by mechanism which imparts a pivotal swinging movement to the manipulator.





Riter-Conley Mechanism for Manipulating Retort-Closing Plugs.

Fig. 1 is a side elevation (partly in section) of a bench of retorts, together with the mechanism for manipulating the plugs. Fig. 2 is a face view of the manipulator support. Fig. 3 is a top plan. Fig. 4 is an elevation and a vertical cross-section of the manipulator on a larger scale. Fig. 5 is a sectional plan of a portion of the length of one of the retorts.

The bench is formed as usual of refractory material, with a cast-iron mouthpiece and door for the charging end communicating with the stand-pipe. At the discharging end is a cast-iron mouthpiece with door. Plugs A and B close the charging and discharging ends—the only difference between the two being that A is formed with a passage through which the gas flows to the standpipe, while B seals the discharging end of the retort. The plugs are made of refractory material, and their outer faces are formed with a reduced neck portion to which is secured a metallic strap-like bridle carrying two upper lugs C and a central lower lug D for the manipulator. There are two manipulators, one for either end. They consist of a trolley frame E having a roller which travels on the upper face of a track bar and with a roller on its under face. The journal of the latter is eccentrically mounted on the frame, and can be turned by a hand lever F, thereby varying the position of the frame and either raising or lowering the arm G, as shown in full and dotted lines in fig. 4. At the outer end of the arm are the jaws, which cooperate with the lugs of the plugs. With an arm as in the dotted lines, the tilting of the frame by turning the lever F raises the arm into the full-line position and engages the jaws with the plug lugs. The manipulator may be readily moved on a track with an arm projected through the mouthpiece at either end of the retort, and by the operation described it may be caused to engage and withdraw the plug, supporting it in its withdrawn position as in figs. 1, 2, and 3, and similarly serving to reposition the plug when the retort is to be closed.

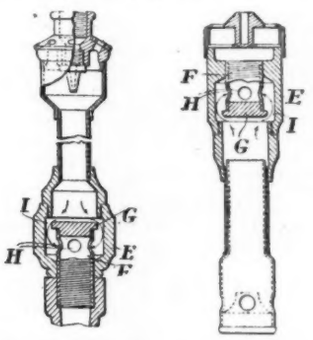
The mechanism is mounted on a carriage H, which is movable horizontally across the face of the bench on tracks. For adjusting the manipulator vertically, the carriage may support the vertical guide-forming beams or posts on which the frame slides, with the top transverse bar connected to supporting chains passing around elevated sheaves and downwardly to drums on a crank shaft mounted on the carriage. The bar I of the sliding frame, together with the bar beneath, provide a support to which the track bar is pivotally secured, so that the track and its manipulator may be swung laterally out of the way when not in use or even when supporting a removed plug.

Incandescent Gas-Burners.

CASBON, W., and DUNKINSON, A. J., of Hitchin.

No. 17,089; Dec. 4, 1915.

This invention relates to atmospheric gas-burners in which a baffle or striking plate is arranged in the passage between the air inlet and the nozzle or support for the mantle—such a construction as is shown in patent No. 20,286 of 1895—with the object of adapting this form of baffle to the ordinary type of upright or inverted burner.



Casbon and Dunkinson's Incandescent Burners.

A longitudinal section is given illustrating the application of the invention to an inverted burner; also to an upright burner.

The burner tube, mixing chamber, gas-nozzle, and air inlets are provided as usual. E is a box arranged with a baffle tube F in it, carrying on its inner end a baffle plate G. The baffle tube has formed in it openings H, through which the air and gas mixture which passes through the burner tube flows to the mantle, and which mixture, as it strikes the baffle plate, is diverted laterally through the annular opening I.

The mixture of air and gas passes down through the burner tube and strikes the baffle plate G, so that it is directed laterally, and thence flows through the holes H to the burner—a further mixing of the air and gas being thereby effected. The baffle plate serves in lieu of the wire gauze usually employed for preventing the flame lighting-back.

When applying the invention to an upright burner, a cap having a central support for the mantle carrying rod with an annular opening around it is screwed on to the box E.

Treatment of Coal Gas.

WHITE, A. E.; a communication from the RITER-CONLEY MANUFACTURING COMPANY, of Lectsdale, Penn., U.S.A.

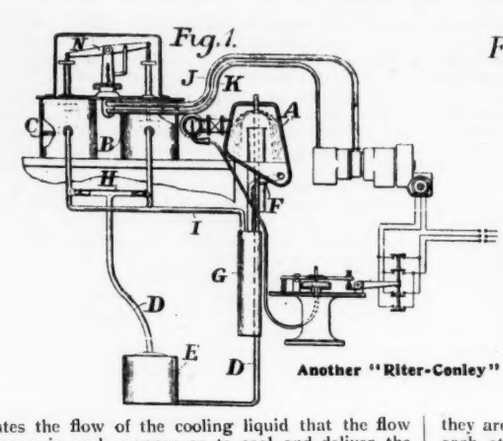
No. 17,894; Dec. 22, 1915.

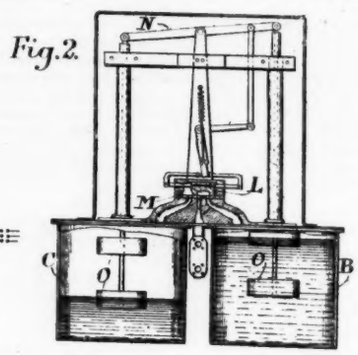
This invention relates to the purifying of coal gas during its passage from the retort to the off-take main, and constitutes a method of cooling the gas and precipitating the heavier hydrocarbons—tar, naphthalene, &c.—before they can pass to the main and apparatus beyond—"thereby eliminating much of the stoppage heretofore experienced and decreasing the work of those portions of the apparatus or system to which the gas is delivered."

In certain of its aspects, the invention may be regarded (the patentees remark) as an improvement in the method described in patent No. 16,891, of 1915 [see Dec. 5, 1916, p. 496], where "the cooling is effected by a liquid circulating system, which is preferably closed, so that the liquid is used over and over again for the purpose of saving ammonia, since after the cooling medium has become saturated, no additional ammonia is abstracted by the liquid from the gas."

One of the objects of the present invention is to avoid disadvantages and fluctuations in the cooling operation, and, furthermore, to avoid the necessity of constantly watching the operation of the cooling means to insure that the desired and preferably uniform degree of temperature reduction is being maintained. The proposal is to utilize the temperature of the cooled gas to control the extent of cooling, by utilizing the temperature of the cooled gas to govern the flow of the cooling medium. The invention also provides mechanism which automatically maintains a predetermined temperature reduction of the gas.

In the preferred form of the invention (as shown), a thermostat





Another "Riter-Conley" Device.

so varies and regulates the flow of the cooling liquid that the flow will increase or decrease in such manner as to cool and deliver the gas to the take-off main at a substantially uniform temperature, regardless of temperature variations, before the gas is subjected to the cooling process—thereby insuring uniform precipitation of impurities. In accordance with a further feature of the invention, an uninterrupted circulation of the cooling liquid is effected by maintaining the circulation by the action of air or other gaseous fluid under the action of a pump in such manner as to cause the requisite flow or circulation without passing the liquid through the pump, as is usual in circulation systems.

The preferred form of circulating system includes mechanism for alternating the simultaneous filling and emptying of two liquid containers which are included in the system—one container discharging while the other is filling, and *vice versâ;* the liquid levels in the containers operating to automatically reverse these operations without interfering with the continuity of the flow.

It has already been proposed to provide an apparatus for cooling the gas after it leaves the hydraulic main by employing apparatus working on the countercurrent principle, with the current of gas moving in one direction and a current of cooling liquid or air moving in the opposite direction through a series of tubes arranged in the passage of the gas. In connection with such apparatus, it has been proposed to provide a damper controlled by a thermostat to automatically maintain a fixed temperature by increasing or decreasing the amount of the current of the cooling fluids. The present invention contemplates utilizing the temperature of the cooled gas for controlling or governing the extent of cooling—a "feature, so far as is known, broadly novel in the art."

Fig. 1 is a diagrammatic view of the present improvement. Fig. 2 is a view of the pair of tanks or containers, shown partly in elevation and partly in section.

The gas delivering apparatus consists of standpipes receiving gas from a vertical series of retorts in benches, with the upper ends of the stand-pipes entered in the containers or cooling chambers from which lead outlet pipes to the take-off main—also as figured in the "JOURNAL" for Dec. 5, p. 496. The chambers are formed in units of sufficient length and capacity to serve two or three standpipes; and each container is provided with at least two outlets leading to the main, each of which is valved to so regulate and control the outflow from different portions of the container as to maintain uniformity in the temperature and quality of the gas passing to the take-off.

The container or cooling chamber A (now shown in fig. 1) is part of a closed liquid circulation system, which includes two closed tanks or reservoirs B C. The liquid is discharged into the upper portion of each container through sprayers, being conducted thereto from one or the other of the tanks through the pipe D; a cooler E being included in the pipe for reducing the temperature of the liquid to the desired degree in its passage to the sprayers. The liquid which collects in the lower portion of the container is laden with the precipitated impurities discharged through the pipe F of the circulation system into a tar separator and collector G, and from the latter to the tank B or C.

The liquid is caused to circulate by withdrawing air from the upper portion of one of the tanks and thereby inducing an inward flow of liquid, and simultaneously forcing air into the upper portion of the other tank and causing the liquid to flow from it. In the position shown, tank B is discharging its liquid contents and tank C is filling. Each tank empties and fills alternately through pipes connected by the pipe for the forward or outward flow through the pipe D, and with both pipes connected to the pipe I for the inward or return flow. Air under pressure for causing the cooling liquid to circulate is admitted to the discharging tanks, through pipe J, and is withdrawn from the charging or filling tank through pipe K; these pipes being respectively connected to the outlet and intake of an air-pump.

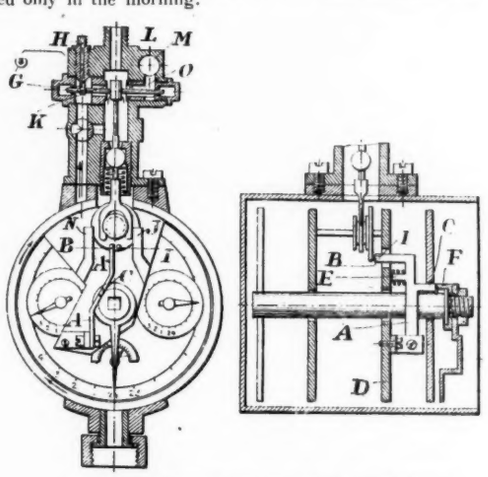
For controlling communication between the air pipes and tanks B and C, a slide valve L, provided with an operating rein, is mounted in a chest in which the valve-seat M is formed with three ports which align with each other longitudinally of the chest. The central port is in communication with the air inlet pipe, and ports at opposite sides are, respectively, in communication with the tanks B and C. Another port maintains the air outlet pipe in constant communication with the chest at the exterior of valve L. The slide valve is reversed for reversing the action of the tanks B and C by displacement devices within each tank which are acted upon by the liquid, and which transmit the valve-shifting movement at the proper times through the medium of an oscillating beam centrally mounted on an upright, with rods depending from opposite ends into the respective tanks, with a displacement head O secured to each rod. "While these heads perform, in a measure, the function of floats, they are preferably formed of solid metal—the two sets so balancing each other and their displacement action in the liquid being such as to render them quite as effective as floats, without, however, subjecting the apparatus to the danger of breakdown resulting from a leaky or otherwise impaired float." As the tank B empties with a corresponding filling of the tank C, the lowering tendency of displacement heads in the tank B, and the corresponding buoyancy of the heads in the tank C, causes the sets to shift their position in such manner that, when there has been sufficient emptying of one tank and filling of the other, the displacement action rocks the beam N and shifts the valve by means described in the specification.

Igniting and Extinguishing Burners.—No. 100,307.

FARGE, F. C., of Nice.

No. 4828; April 1, 1916. Convention date, April 16, 1915.

This is a modification of the invention described in patent No. 24,223 of 1912, with the object of providing apparatus to effect at variable times an intermediate extinction between the ignition in the evening and the extinction in the morning—designed for lamps having several burners of which a certain number are required to be extinguished in the middle of the night, while the remainder are extinguished only in the morning.



Farge's Gas-Burner Lighter and Extinguisher.

Cross sections are given of the apparatus, taken at right angles to one another.

A lever A, having two arms B C, is pivoted on an angled bracket fixed to the motion plate D. The lever carries a coiled spring mounted on the stud E. It further comprises a ring F having a circular ramp and a "drop." The ring is provided with internal teeth fitting exactly round the stud fixed on the driving shaft. Thus the "drop" can be moved away from or towards the arm C, so as to thereby determine exactly the time of the intermediate extinction. The apparatus also comprises a washer G notched in its lower part, and fixed to the left-hand rod of the double valve. The washer is designed to prevent gas reaching the pilot jets through the passage during the lighting period.

The apparatus operates in the following manner:

TOTAL IGNITION.—Before the ignition, the pin I rests on the arm of the lever J. The left face of the double valve bears upon its seat and closes the duct K supplying gas to the distributing chamber, while the washer G, having been shifted towards the left, allows gas to pass to the pilot jets. The lever A is pushed back by the projecting portion of the ring F, and its arm B engages the plate D. On the igniting mechanism being released, the lever J moves out of the path of the pin I, which strikes the arm B of the lever A and becomes stationary. During this period, the left face of the valve moved by the eccentric has allowed the gas to pass into the distributing chamber. The orifice L feeds the central burner jet and the orifice M feeds the burner jet or jets which are to be extinguished at the first extinction. Further, as soon as the ignition has been effected, the washer G shuts off the passage H supplying the pilot jets.

PARTIAL EXTINCTION.—At the hour selected for the first extinc-

tion, the driving shaft, having carried the ring F with it in its rotary motion, the "drop" comes in front of the arm C, which, being drawn by the spring, is released and disengages the pin I which is held by the arm B. The pin then makes a quarter of a revolution and stops against the lever N. In this rotation, however, the double valve has moved towards the right, so that the right-hand face has now closed the orifice O, thus effecting the extinction of the burner jets supplied by the pipe M. The pilot jets have become ignited, because the washer G, in its travel, has moved sufficiently towards the right to uncover the orifice of the pipe.

TOTAL EXTINCTION.—A third disengagement effected by the lever N leaves the pin I free to make a half revolution instead of a quarter revolution as before. The return into the initial position takes place from that instant without stoppage; and when the left-hand face of the double valve bears again upon its seat to close the passage K, the whole of the burner jets will be extinguished, whereas the pilot jets will remain lit.

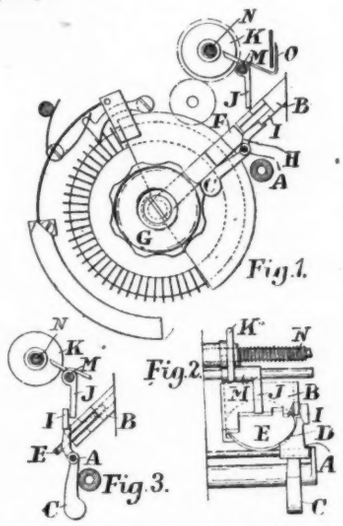
Coin-Freed Prepayment Mechanism.—No. 102,166.

MERCER, A., of Longsight, YOUNG, E., of Droylsden, and METERS LIMITED, of Manchester.

No. 637; Jan. 14, 1916.

This is a modification of the invention described in patent No. 6739 of 1915, in which the proposal was to employ two pivoted arms or levers adjacent to the coin shoot—one of which served to prevent coins being delivered from the coin shoot when the coin holder was not in position, or when it already had a coin in it, while the other served to prevent the passage of coins to the coin holder when the prepayment mechanism had been operated to the full predetermined prepayment capacity.

The present invention comprises the provision adjacent to the coin-shoot, of a single pivoted arm or lever set to operate at one side of the shoot, so as to be capable of obstructing the passing from it of a single coin or of the second of two coins inserted immediately after one another in the shoot; the lever being also adapted to co-operate with the co-acting parts of the metering and prepayment mechanism, so as to prevent the egress of coins from the coin-shoot when the prepayment mechanism has been actuated to the full predetermined prepayment capacity.



Mercer and Young's (Meters Limited) Coin-Freed Meters.

Fig. 1 is an end view (partly in section) of mechanism similar to that in the 1915 specification, but having the modified arrangement of coin-control applied to it. Fig. 2 is an end elevation looking from left to right of fig. 1, showing the coin-shoot and connected parts with a coin held in the shoot. Fig. 3 is an end view of the parts shown in fig. 2, but serving also to illustrate the action of the metering mechanism in preventing the passage of coins into the meter when the prepayment mechanism has been actuated to the full predetermined prepayment capacity.

The pivoted arm or lever A is mounted adjacent to the base of the coin-shoot B, the lower end of it being weighted at C (or acting as a weight) to cause the other end to rest normally in a position in which it prevents the egress of coins from the coin-shoot—see figs. 2 and 3. The lever is disposed at one side of the shoot, and preferably has its acting end rounded at D, where it lies adjacent to the coin E issuing from the shoot, so that should two coins be inserted immediately one after another in the coin-shoot and one be received by the movable coin-holder F of the prepayment mechanism, then upon the holder being rotated clear of the base of the shoot by the handle G, the end D of the lever will move in front of the coin in the shoot and prevent its egress. The coin-holder F, when positioned to receive a coin from the shoot as in fig. 1, engages the lever at H above its pivot point, and so holds it in a position clear of the shoot, so that the coin in the shoot can travel into the coin-holder.

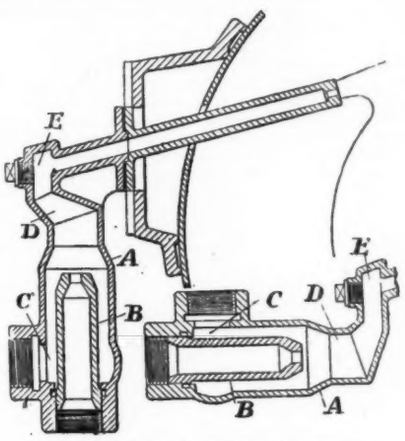
The lever A has an extension piece I, which co-operates with a movable stop J actuated in one or other direction by the interaction of the prepayment mechanism. Thus, for example, the stop may be traversed by a nut-like part K, which operates a slide M carrying the stop J—the nut being rotated by the prepayment mechanism when a coin is inserted and the coin-holder F rotated; and the screw N, which passes through the nut K, and is capable of rotary, but not longitudinal, movement, being rotated by the measuring mechanism. When, therefore, the prepayment mechanism has been actuated to its full prepayment capacity, the stop J prevents any movement of the lever A by the coin-holder F [see fig. 3], so that no further coins can be inserted. The continued actuation of the metering mechanism withdraws the stop J from the lever A, so that further prepayment can be made. The finger O serves to indicate the amount of prepayment made in the meter.

Gas-Heating Burners.—No. 102,393.

YATES, H. JAMES, and ASKAM, J. F., of Aston, Birmingham.

No. 836; Jan. 18, 1916.

This invention relates to gas-burners employed in gas-furnaces, muffles, and other heating apparatus, with the object of enabling a "more efficient and economical utilization of the gas to be obtained." There is a two-part mixing tube, the first part of which is tapered so that it decreases in diameter towards its outlet end, is formed with one or more abrupt bends, and is provided with a pocket adjacent to the inlet end of the second part of the mixing tube as now to be described.



Yates and Askam's Gas-Heating Burner.

A section of a burner constructed in accordance with the invention is given; also a section of an alternative form of mixing tube.

The tapering mixing tube A decreases in diameter towards the outlet, and is fitted at one end with an air nozzle B around which is formed a gas inlet chamber C—these concentric passages being arranged in axial alignment with one end of the mixing tube. At a convenient position in the tube an abrupt bend D is formed; and at the end of the bend is arranged a pocket E in which the second part of the mixing tube has its origin. "It is advantageous to make the angle through which the direction of flow is changed as large as possible." In the main form shown, the mixture is deflected through two contrary angles in passing from A to E, and through a right angle when passing into the second part of the tube from E. In the second form, the mixture is diverted abruptly through one right angle in passing from the first portion of the tube to the pocket; and then in passing from the pocket to the second portion, it is abruptly turned through approximately another right angle.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 29.]

Nos. 18,106—18,440.

ARMSTRONG, H.—"Still for distilling ammonia, &c., liquors." No. 18,224.

BRADLEY, L.—"Separation of gases, and formation of products." No. 18,303.

CHAMIER, F. W.—"Manufacture of power gas and recovery of hydrocarbon oils." No. 18,335.

CHENARD, E. A.—"Apparatus for continuous distillation." No. 18,273.

COLE, W. L.—"Joints in iron and steel piping." No. 18,174.

CRAIG, H. J.—See Chamier. No. 18,335.

DIAMOND, W.—See Armstrong. No. 18,224.

FORWOOD, G. F.—"Treatment of hydrocarbons." No. 18,383.

FRANCE, A. G.—"Joints for pipes." No. 18,119.

FRANCKS, A. H.—"Operating electric switches from a distance." No. 18,307.

GARTLEY, W. H.—"Manufacture of toluol." No. 18,270.

GLOVER, S.—"Mouthpieces and doors for retorts." No. 18,384.

KOPCZEWSKI, W. S.—"Gas-turbines." No. 18,419.

MATHER, C.—"Instantaneous water-heaters." No. 18,228.

MOELLER, J. F. L.—See Chamier. No. 18,335.

MOND, A.—See Bradley. No. 18,303.

POORE, P.—"Carbonization of wood, &c." No. 18,314.

QUASI-ARC COMPANY.—See Cole. No. 18,174.

SCHMIDT, W. A.—See Bradley. No. 18,303.

TELEPHOS DOMESTIC AND STREET LIGHTING COMPANY.—See Francks. No. 18,307.

THUMAN, F.—See Gartley. No. 18,270.

UNIT ENGINEERING COMPANY.—See Mather. No. 18,228.

WATSON, H. T.—"Jointing together lengths of pipe." No. 18,204.

WEST, J.—See Glover. No. 18,384.

WILD, W.—See Glover. No. 18,384.

WILLETTS, G. F.—"Gas shades and reflectors." No. 18,404.

MISCELLANEOUS NEWS.

TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.

Borrowing Powers—Redeemable Debentures.

At an Extraordinary General Meeting of the Company, held at the Offices, High Road, Tottenham, on the 22nd ult., a resolution was unanimously carried authorizing the Directors, "in accordance with the provisions of section 30 of the Act of 1906 and section 23 of the Act of 1913, to borrow on mortgage of the undertaking of the Company, by the creation of redeemable mortgages or mortgage debentures, any sum or sums not exceeding in the whole such sum as, with the amount already raised by the creation and issue of debenture stock, will amount to one-third part of the capital for the time being of the Company actually raised, and to issue such redeemable mortgages or mortgage debentures on such terms and conditions, and at such time and in such amounts, as the Directors may think fit."

The CHAIRMAN (the Right Hon. Sir Daniel F. Goddard, M.P.) said the proprietors would recall that, when he addressed them at the general meeting in August, he pointed out the financial position of the undertaking as regarded capital, &c., and explained what had been the policy of the Board in reference to it. The capital account, when they last met, was already overspent to the extent of £77,446. Since then there had been a further considerable outlay in connection with the extension of the business. They had put up entirely new works inside the others; and this, of course, had cost a lot of money, amounting to £37,000. So that now they had overspent their capital by £115,000. At the time the Company had borrowed £70,000 from their bankers to meet the overdraft on capital account, and since then they had had to borrow a further £90,000; so that to-day the overdraft at the bank was £160,000. In addition to the amount to be provided for on capital expenditure, they had to provide a certain amount for working capital, which they put at £50,000. The money the bankers had advanced them was lent at the current bank rate, which was now 6 p. ct.; and, unfortunately, they had no guarantee that this rate would not be exceeded. The Board considered very carefully what in these circumstances they ought to do. While they thought the best plan would be to get the consent of the proprietors to their issuing the remainder of the £161,676 which they were authorized to raise on loan capital, they considered it would be wiser for them to issue it in a form in which it could be redeemed, rather than in a form which would be permanent. The Treasury had given their sanction on Nov. 23 (to remain in force for three months) to the issue of redeemable debentures to the extent of £161,676; and therefore the Directors had taken the earliest opportunity of submitting the matter to the proprietors.

COLONIAL GAS ASSOCIATION, LIMITED.

Large Increases in Consumption—Preference Shares in Lieu of Earned Dividend.

The Ordinary General Meeting was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. A. J. Kingdon) read the notice convening the meeting and the Auditors' report; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN said the meeting was being held somewhat later than usual. The Directors tried to get ready for it by the middle of November; but for certain reasons—one of which was that some of the papers went down in the "Arabia"—they had been unable to do so. Since the last meeting, as the shareholders would have noticed, the Board had appointed a new Director in Melbourne—Mr. John S. Weir. They were pleased to say he was a gentleman fully acquainted with gas matters all his life, as his father many years ago was Chief Engineer and Manager of the Metropolitan Gas Company of Melbourne. He was a thoroughly good business man, and had been Mayor of his town of Kew—a near suburb of Melbourne. A few months back, he paid a visit to London; and the Board had the pleasure of meeting him three or four times. He was present at a Board meeting when the accounts were discussed; and he approved of all the Directors wished to do, and of the proposals to be laid before this meeting. In moving the adoption of the balance-sheet and report, he (the Chairman) might say that the Directors were much pleased at being able to present such an excellent result, as it was a record. Last year they were hoping, in spite of the outrageous and wicked war, that they would have a good year's working; and it was most gratifying that the revenue enabled them to increase the dividend to 6$\frac{1}{16}$ p.ct., giving 5 p.ct. free of income-tax, after providing larger sums for depreciation, and adding to the reserve fund. "The fly in the ointment" this year, however, was that they could not pay the dividend in cash, and that they were only able to pay it in preference shares, which proceeding the shareholders agreed to by special resolution at the meeting in December last. The rate then fixed was 6 p.ct.; but later on, at an extraordinary meeting, a special resolution would be proposed to increase the rate to 7 p.ct. This rate was one that the Board considered could be well maintained, and really was what the Association had had to pay their bankers for the overdraft. The shareholders would probably see in the near future a rate equal to this for the ordinary shares, as the prospects were really excellent. It would have been noticed in the report that the increased sales of gas during the past year amounted to no less than 21 p. ct.; and since then, from June last, the shareholders would be pleased to hear they had had an increase of about 30 p.ct. on the 20 p.ct. of the previous year. Turning to the balance-sheet, all must consider it a most gratifying one, as in every case, with one exception, the totals were higher than they were a year ago. The sole exception was £8000 decrease (from £16,700 to £8700) in temporary loans. The balance-sheet, therefore, gave a better result than any gas company of which he knew; and the prospects were such as to encourage the hope that they would exceed in the present year that of the past. Capital expenditure on such a wonderfully growing business was absolutely necessary, and he felt confident would be provided, as with a profit of 9 p ct. last year, and better prospects this, the required amount, it was fully expected, would be forthcoming. The shareholders would have noticed that the Board had increased the amount for depreciation by over £800, and that the reserve fund had been added to by rather more than £400. He felt sure they would also be glad to know that the average cost of coal was less than 24s. per ton, as well as to hear that the late strike did not cause any anxiety, as their stocks were fairly large. In conclusion, he wished to assure the shareholders that the prospects were good. He proposed, with considerable pleasure, that the balance-sheet and report be adopted.

Mr. CHARLES HUNT seconded the motion.

Mr. WORTHINGTON CHURCH said he noticed the Board, in their report, gave the increase in the sales of gas as 34 million c.ft.; but they did not supply any information as to the total quantity of gas sold during the twelve months, nor as to the quantity of coal carbonized. It would be interesting to gas makers to have these particulars. He asked if the Directors' fees were included in the £5360 "administration expenses." [The CHAIRMAN: Yes.] Also the amount of the Directors' fees. On the whole, he thought the balance-sheet was a very gratifying one. While the Directors were all men well known in the gas world, and had the entire confidence of the shareholders, it struck him as rather peculiar that there should be only three Directors in Australia to manage fifteen works, and yet five Directors on the Board in London. He hardly thought it was essential to have such a large Board in London; and perhaps they would take into consideration when the next vacancy arose as to whether it was necessary to fill it. He hoped his remarks would be taken in a friendly way, and not be considered critical.

Mr. M. CURRY asked whether the Directors in Australia or in London were responsible for the policy that had been adopted. Certainly the shareholders had not ordered it. Money which was not capital had been spent for capital purposes; and large purchases had been made out in Australia. So far as he could see, no explanation had been made as to the situation in which they were landed. The situation was that they had made large profits; and a certain proportion of these profits were due to the shareholders. But when they came to ask the Directors for the money, they were told it had been spent on something else.

The CHAIRMAN said the Board had had full sanction for what they had done. Before the war came, they purchased two works near Melbourne; and these had enabled them to make large increases in consumption. They were committed to the purchase and extension of these works some months before war broke out. Then the war came, and the Treasury would not allow them to raise the necessary capital; so that they were obliged to borrow from the bank. But they were now £8000 down on their loans as compared with a year ago. As to the Board in London, it was in absolute authority; and they had had the same number of Directors for some years. The last Director elected was the Hon. Sir J. W. Taverner, K.C.M.G., late Agent-General for Victoria. He was the only man on the Board who was not an engineer; but he was a very valuable Director.

Mr. CURRY thought the right course for the Directors to have pursued would have been to continue with the bankers, and to have allowed the shareholders to receive their dividends.

Mr. WORTHINGTON CHURCH said he did not agree with the gentleman who had spoken. He (Mr. Church) did not criticize the purchases made; and he knew how difficult it was to raise capital at the present time. He was in sympathy with the Board in the position in which they were now in. It was not their fault.

Sir FREDERIC PAINTER thought the Board were doing the right thing in paying the shareholders out in shares.

The CHAIRMAN, in reply to Mr. Church, said the increase in the consumption was 34 million c.ft.; and they sold 194 millions. The capital was under £1200 per million c.ft., which was very good for a company carrying on its operations abroad.

Mr. E. H. HAYWOOD said he was a shareholder in a trust in which he himself participated. One of the terms of the trust was that the trustees could not put any part of the income to capital. There might be other people in the same situation. One realized the good position of the Company. Had the Board considered the passing of the dividend altogether, rather than create more preference shares, which would stand before the ordinary shares?

Mr. W. CHAFFER said he was a shareholder in his own name as well as the executor of a lady who recently died, and whose shares would have to be sold. Supposing the Directors had passed the dividend entirely, where would he have been, or anybody else who wished to sell shares? He had given very careful consideration to the question whether the Directors had done a wise thing in paying the dividend in shares; and he had come to the conclusion that they had. If the dividend were passed, they would soon see the shares standing at about half their value; and they were certainly worth their par value. They were suffering the same as other people; and the bankers would not advance money in unlimited amount.

Mr. F. G. PILLEY said he wanted to take exception to the advice given that they should continue to borrow from the bank. He thought it was bad advice. These were not times to be in the power of any bank. They might be very old customers of a bank; but that was nothing if the bank had its hands forced. They might yet come to still more critical times; and then the Company would be in a better position to get what help they might want from the bank. The gentleman who spoke of "depreciated paper" convicted himself out of his own mouth. If he was certain this was "depreciated paper," then it showed the Company would have a difficulty in getting money outside; and therefore they ought to stand by their own ship, and support their own Company. Things were not likely to be easier; but it was merely a question here of overspent capital, which would adjust itself

in due course, as and when they were able to raise capital. What the Directors had done was to ask the shareholders to stand by their own, and help them out of a difficulty—the right course to pursue.

The motion was carried.

The CHAIRMAN proposed: "That a dividend at the rate of 6 p.ct. per annum be declared upon the preference shares of the Company, calculated up to June 30, 1916, and that such dividend be payable in cash. That a dividend of 5 p.ct., free of income-tax be declared upon the ordinary shares of the Company for the year ended June 30, 1916, equivalent to £6 1s. 3d. p.ct., less tax at 3s. 6d. in the pound, and that such dividend be paid by the issue as on Jan. 1, 1917, in preference shares of the Company, credited as fully paid-up, each ordinary shareholder in the Company being entitled to one of such preference shares for every sum of £1 to which he or she would have been entitled by way of dividend if such dividend had been declared payable in cash. Fractions of £1 to be paid in cash." The Chairman remarked that, following the permission given by the shareholders last year to pay the dividend in preference shares, this was the very best they could do at the moment.

Mr. H. KING HILLER seconded the motion.

Mr. W. E. CURRY proposed, as an amendment, that the dividend on the preference shares be paid in cash, and that the dividend on the ordinary shares be passed.

Mr. M. CURRY seconded the amendment.

On being put to the vote, only three hands were held up in favour of the amendment; and the original motion was passed.

The CHAIRMAN remarked that he might now say that shareholders who would be entitled to dividends up to five shares would have the option of being paid in cash. This would mean something like £700 to £800 in all; and the Directors would be quite willing to arrange that. Someone would buy the shares, and give the shareholders par value free from any expense.

On the motion of the CHAIRMAN, seconded by Mr. F. R. SMITH, the retiring Directors, Mr. John S. Weir and Mr. H. King Hiller, were re-elected.

On the proposition of Sir F. PAINTER, seconded by Mr. CHAFFER, the Auditors, Messrs. Wood, Drew, and Co., were re-appointed at a fee of 25 guineas.

Sir F. PAINTER moved a hearty vote of thanks to the Directors in London and Australia, and to the staff. The shareholders were well satisfied with all that had been done by the whole of the Directors and the staff in Australia.

Mr. SAWARD seconded the motion, which was unanimously carried.

Extraordinary General Meeting.

An Extraordinary General Meeting was then held for the consideration of the following special resolution:

That special resolution No. 1, passed at an extraordinary general meeting of the Company, on Dec. 30, 1915, and duly confirmed at a subsequent extraordinary general meeting of the Company, on Jan. 25, 1916, be altered in the following manner—namely: "The figure 50,000 be substituted for the figure 30,000 appearing between the words 'issued' and 'thereof' in the first line of the second paragraph of the said resolution, and the figure '7' be substituted for the figure '6' appearing between the words 'at the rate of' and 'per cent. per annum' in the third line of the second paragraph of the said resolution, that such alteration take effect as from Jan. 1, 1917, and that in all other respects the said resolution be confirmed."

The CHAIRMAN, in moving the adoption of the resolution, said the progress of the Company, which had been so great, with the largely increased make and sale of gas, could not be carried out without extension to the plant. This had to be done without delay; and their bank in Australia were good enough to finance the Company. They had to face a further moderate expenditure, as a gasholder would be necessary; and, in looking forward to the progress of the Company, it was well to make provision for the future. This was the reason they were asking the shareholders to increase the issue of preference shares, and to raise the rate from 6 to 7 p.ct. At this percentage, and income-tax at the present rate, it would give a net return of £5 5s., which really ought to induce the shareholders to apply for the shares, and give the Directors all the capital they required. The Board were unanimous; and when in London their new Director in Melbourne (Mr. Weir) heartily endorsed the policy. He said they must provide what was necessary to meet the future requirements of the Association, and that they had excellent prospects before them. Since the 6 p.ct. preference shares were sanctioned, they had issued some 14,000 shares; but after the 6 p.ct. Exchequer Bonds were introduced, the rate of 6 p.ct. did not bring the Company further capital. The Directors were hopeful with the 7 p.ct. now recommended they would get what they required; and that the shareholders would take the shares as a sound investment. He felt confident it would be difficult for anyone to find a better.

Mr. HUNT, in seconding the motion, said the object was, of course, to meet the money market, and to enable the Directors to raise the necessary capital to extend the business. There was no standing still with a gas company. They must either go on or go back. That was really the reason why at such a time as this expenditure was necessary if they were to progress. They had also to pay more for the money they had got to raise. This was the sole object of the resolution—to enable them to raise the further capital required.

Mr. HAYWOOD asked whether the proposal referred not only to the shares to be issued, but to those already issued.

Mr. HUNT: The existing holders will get 7 p.ct., as well as those we hope to attract.

The resolution was carried; and this concluded the proceedings.

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TORONTO CONSUMERS' GAS COMPANY.

In the report—dealing with the year ended Sept. 30 last—which they presented at the 58th annual meeting of the Consumers' Gas Company of Toronto, the Directors stated that, notwithstanding the unusual conditions which have existed as a result of the war, there has been a substantial gain in the number of customers; while the quantity of gas sold during the year exceeded the quantity sold in any other year in the history of the Company. Having in mind the keenness of competition, and the fact that a large number of citizens are absent from the city on military service, the effectiveness of the Company's policy of advertising and proving the value of gas for illuminating, as well as for fuel for domestic and industrial purposes, has been fully demonstrated. A few years ago gas was used principally for illuminating purposes. It has now a thousand other uses; and it has been the Company's policy to develop and sell appliances for any, and all, of the purposes for which gas may be advantageously employed. The continued and increasing rise in the price of raw materials, and the higher wages demanded for labour, have materially increased operating costs. The friendly action brought by the City of Toronto against the Gas Company, to determine whether the City or the Company should bear the cost of the removal of the gas-mains laid in a city street to another location in the street, in order to permit the City to construct sewers or other local improvement works in such street, has finally been determined by the Judicial Committee of the Privy Council in favour of the Company. At the trial of the action in the County Court of the County of York, Judge Winchester gave judgment in favour of the City; but his judgment was reversed by the First Appellate Division of the Supreme Court of Ontario. An appeal was taken by the City to the Judicial Committee of the Privy Council, who, by a judgment delivered on Aug. 1 last, sustained the judgment of the Appellate Division. The Judicial Committee of the Privy Council found that, while it was within the right of the City in constructing a drain, to order the lowering of the Company's gas-main, the City were bound to pay the cost of doing the work. The settlement of this question will regulate the general liability as between the City and the Company for the cost of operations of such nature.

At the meeting, after the report had been adopted, the General Manager (Mr. Arthur Hewitt) referred to the Company's activities, and specially to the great increase in the volume of gas sold for industrial purposes. He said he had been asked by one of the shareholders if the statement contained in the report—that there are now one thousand uses for gas—was a figure of speech. The report stated an actual fact. There are now literally more than one thousand kinds of appliances in which gas is being employed with most advantageous results to the users. He alluded to the progress being made in the efforts to develop a satisfactory system for the heating of residences by means of gas, and stated that quite a few installations of such appliances had already been made in Toronto. Answering a question as to the Company's employees who have enlisted for military service overseas, he said that of the 947 male employees, 354, or 37 p.ct., have so enlisted.

The shareholders confirmed grants made by the Directors during the year of $5000 to the Toronto and York County Patriotic Fund, $2000 to the British Red Cross Fund, and $30,008 payments to wives and families of men enlisted for active military service overseas.

There were 104,541 meters in use at Sept. 30, as compared with 102,548 a year before.

INCREASED PRICES AT NOTTINGHAM.

Following the increase of 12½ p.ct. made in July, 1915, in the price charged to ordinary consumers of gas in Nottingham, which yielded enhanced receipts up to March, 1916, of £17,388, the Corporation Committee now propose to advance the rates for power and "gassing" purposes. The increases will be roughly equal to about 5 p.c. In justification of the step, the Committee point out that since the previous increase there has been a continual advance in the cost of gas production, and to such an extent that the price now charged for power purposes is less than the expense of production.

The increase will be according to the following new scale: If the consumption is under 100,000 c.ft. per quarter, 2s. 3d. per 1000 c.ft.; 100,000 and under 200,000 c.ft., 2s. 2d.; 200,000 and under 300,000 c.ft., 2s. 1d.; 300,000 c.ft. or over, 2s. For "gassing" purposes the charge for any quantity consumed is to be 2s. 4d. per 1000 c.ft. The charges for gas supplied for power and "gassing" purposes in the districts of Stoke Bardolph, Burbon Joyce, Linby, Selston and Underwood, and Cotgrave, all within a few miles radius of the municipal boundary, will be 6d. per 1000 c.ft. in excess of this scale. These charges will be net—that is to say, there will be no 12½ p.ct. increase charged on the prices here set out, as in the case of gas supplied for lighting and domestic purposes. The Committee have arranged that the increase shall come into operation from the meter-taking for the current quarter.

Fatality at the Belfast Gas-Works.—The death has occurred in Belfast of Thomas Edmundson, who met with an accident last Saturday week. He was employed as a labourer at the gas-works, and, missing his footing, fell into a hopper, and was buried several hours under 4 tons of hot coke. At the inquest, it was stated that the deceased discharged his duties honestly and diligently up to the time of the accident; and the Corporation, so far as they legally could, would compensate the unfortunate widow. An indication of the esteem in which he was held was given by the fact that his fellow workmen were paying all the expenses in connection with the funeral. There was no evidence at all to show how it was deceased fell into the hopper.

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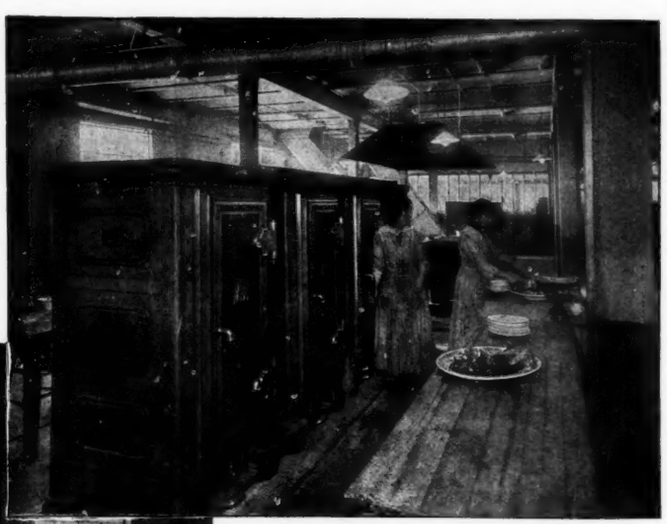

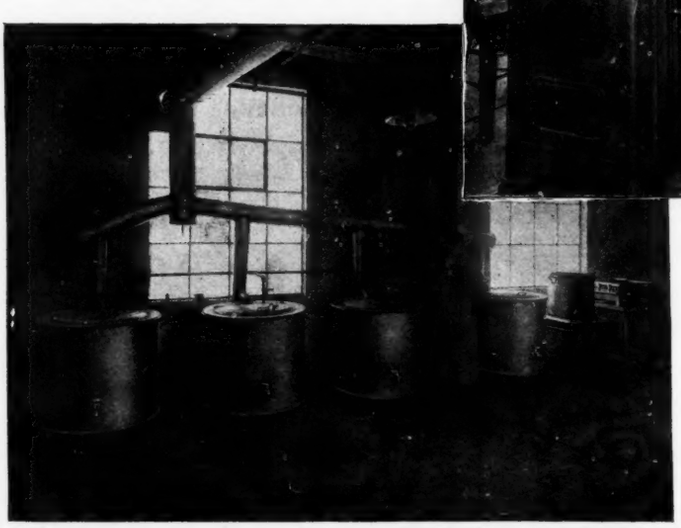

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FOOD PRODUCTION AND FERTILIZERS.

In the course of an interview with a representative of the "Observer," Mr. Leslie Scott (Chairman of the Parliamentary Agricultural Committee) made some remarks in reference to the subject of an article which Prof. Somerville, of Oxford, has contributed to the pages of "Blackwood's Magazine." In this, the Professor argues that there is no doubt a large increase in the agricultural production of this country can be immediately secured "by using on British land, instead of exporting it to other countries, the whole of the sulphate of ammonia and basic slag which are produced at home."

If, said Mr. Scott, every person interested in increased agricultural production would read this article, it would go far towards creating a well-informed public opinion on the whole subject. The question of fertilizers is of primary importance, ranking equally with machinery and labour. No great increase of production is possible without drastic treatment of the fertilizers problem.

The United Kingdom has been very seriously behind other countries in the use of fertilizers. In 1911, Mr. Seebohm Rowntree, in his book on Belgium, showed, in regard to three important artificial manures, that that country was then using more than three times as much nitrogen as the United Kingdom, more than twice as much phosphate, and thirty-five times as much potash. He added that this comparison went far to explain the immensely greater yield in Belgium than in this country. During the war, when we ought to have been increasing, and greatly increasing, our use of fertilizers, the opposite has taken place. It is to this fact that Prof. Somerville has done such service in calling attention. Potash manures come almost entirely from Germany, and are therefore unavailable; but phosphates, in the shape of basic slag and superphosphates, and nitrogen, in the shape of sulphate of ammonia, are produced in this country. During the war we have been exporting large quantities, all of which ought to have been consumed at home.

As Prof. Somerville points out, of our total production of sulphate of ammonia (400,000 tons per annum), in 1915 we exported three-quarters, mostly to foreign countries. Every ounce of that is needed here. Every hundredweight, as he points out, put into the ground will add four bushels per acre to the yield of wheat, six bushels to the yield of oats, half a ton to the yield of potatoes, and so on. Before the war we used to import superphosphates very largely. We cannot get them now, and the home industry is held up because they cannot be manufactured without sulphuric acid; and the Ministry of Munitions is absorbing nearly all the sulphuric acid. I have in my hand a letter from the West Norfolk Farmers' Manure and Chemical Company, saying that they have already stocked raw materials for 40,000 tons of superphosphates, but that they can do nothing with them because the Ministry of Munitions has taken all the sulphuric acid. For each ton of superphosphates not made five to ten tons of potatoes are lost. The only remedy is to increase the supply of sulphuric acid from at home or abroad.

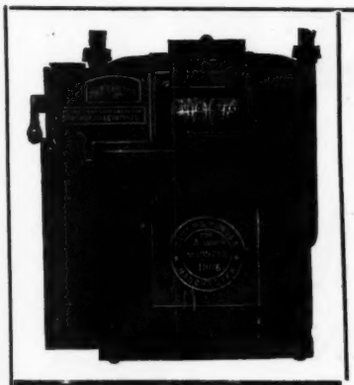
I believe that a practical proposition in connection with zinc concentrates, which before the war were dealt with entirely in Germany, has been put forward. What I want, however, to emphasize, is not any particular detail, but the fundamental importance of making arrangements somehow to supply the farmer with the straw with which he can make his bricks.

Take another instance—basic slag. In 1913 the output in the United Kingdom was between 300,000 and 400,000 tons. During the war additional work and machinery have been contracted for which would bring the output to 500,000 tons; but the necessary licences for building and machinery have been delayed by the Ministry of Munitions, with the result that not an ounce of this additional basic slag will be available this agricultural year, because to do any good it must go on the land in the winter. To make matters worse, as Prof. Somerville points out, some 40,000 tons have been exported in 1916, and even in the month of December the Fertilizers Committee granted a further export licence. The export of both basic slag and sulphate of ammonia ought to be stopped entirely. If the Central Executive, which has been asked for, with Mr. Prothero as President, is appointed, one of its first duties will be to deal with the whole question both of the supply and use of fertilizers.

Mr. F. H. Porter, for many years past the Midland Representative of the Davis Gas-Stove Company, is retiring on a pension after a service of upwards of thirty years.

H.M. Trade Commissioner in New Zealand (Mr. R. W. Dalton) reports that an agent desires to take up the representation in New Zealand of United Kingdom manufacturers of (among other things) plain and fancy gas lighting glassware and malleable iron gas-fittings. United Kingdom manufacturers desirous of appointing a representative for New Zealand may obtain the name and address of the inquirer upon application to the Department of Commercial Intelligence, No. 73, Basinghall Street, E.C.—quoting No. 596.

We have received from Mr. A. Morton Fyffe, the Engineer and General Manager of the Blackburn Corporation Gas-Works, a copy of a handsome brochure, prepared with the excellent object of placing upon record the appreciation of the loyalty of those of the departments' employees—and the proportion to the total number is gratifyingly large—who are now serving in His Majesty's Forces. The booklet consists of portraits of the 75 employees (out of the 260 in the department) who are serving with the army or navy, headed by Captain and Adjutant J. C. Wynne (Assistant Gas Engineer). In each case the date of joining-up is stated; and at the end there are the names of the five men who have given their lives for the cause. The Consumers' Gas Company of Toronto have also compiled an Honour Roll, of which the Empire may well be proud, furnishing particulars of the 354 (out of a total of 947) employees who have enlisted for active military service overseas.



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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 1.

The tone of the tar products market continues generally satisfactory. Pitch remains steady at 22s. per ton in bulk, and creosote is quoted at 75s. per ton in bulk, both at makers' works net cash. Other products are unchanged with the exception of solvent naphtha, which is slightly easier.

Sulphate of ammonia is firm; the prompt export value for 25 p.ct. quality being £18 2s. 6d. per ton net into buyers' bags at makers' works.

Tar Products in the Provinces.

Jan. 1.

The markets for tar products remain the same, and there is no alteration in any values. Business in pitch is still very restricted. Solvent naphtha is quiet, and some sales are reported at low prices. Heavy naphtha is steady; but there seems to be plenty of the article to meet the demand.

The average values of gas-works products during the past week were: Gas-works coal tar, 19s. 3d. to 23s. 3d. Pitch, East Coast, 16s. to 16s. 6d. per ton; West Coast—Manchester 15s. to 15s. 6d., Liverpool 16s. to 16s. 6d., Clyde 17s. to 18s. Benzol, 90 p.ct. North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3¼d. to 3½d. Heavy oils, in bulk, North, 3⅜d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 70s. to 80s., bags included. Anthracene, "A" quality, 2¾d. to 3d. per unit; "B" quality, ¾d. to 1d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Dec.* 30.

On account of the holidays, the volume of business has only been small during the past week; but those transactions which have taken place have shown another increase in values. Although the authorities have given instructions for no more sales to be made to neutral countries at present, all available supplies have continued to be readily absorbed, and the closing quotations are £18 15s. per ton f.o.b. Hull, £18 17s. 6d. f.o.b. Liverpool, and £19 f.o.b. Leith. In the forward position there has also been little passing; but it has transpired that £19 2s. 6d. per ton f.o.b. good port has been realized for January-March shipment.

Nitrate of Soda.

This market has not advanced any further; but the tone is very firm at 19s. 9d. per cwt. for ordinary quality, and 20s. 3d. for refined, on spot.

Sulphate of Ammonia.

From another source, to-day's quotations are given as follows: Outside London make, £17 5s.; Hull, £18; Leith, £18 5s. to £18 7s. 6d.; Liverpool, £18 5s. to £18 7s. 6d.; Middlesbrough, £18 5s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is steadier; the holidays having checked the production of coal, and allowed the arrivals of steamers to be more adequate. Steam coal is, on the whole, steady. Best kinds are 30s. to 32s. 6d. per ton f.o.b. for early delivery, second-class steams are about 25s. 6d., and steam smalls are rather scarcer at from 17s. to 21s. Forward inquiries for steam coal are more in quantity, and prices are firmer for best kinds. In the gas coal trade, there is good inquiry, for both home and shipment, and prices are steadier. Best Durham gas coals are from 25s. to 27s. per ton f.o.b., second-class are from 19s. to 20s., and "Wear Specials" are from 30s. to 32s. Deliveries on contract take up most of the reduced output; and it will be a week or so before there is a normal delivery. As to new contracts, one of about 17,000 tons, of special quality, is reported for Copenhagen, at about 30s. per ton f.o.b. In the coke trade, the demand is more brisk, and the full output is well taken up, both for home consumption and for export to France. Good gas coke is quoted from about 32s. to 34s. per ton f.o.b. on the Tyne; but the high freights for coke to France are still quoted.

British Gas Purifying Materials Company, Ltd.—This is the title of a private Company, formed with a capital of £2500 in £1 shares. Its objects are: To adopt an agreement with W. T. P. Cunningham, and to manufacture and deal in any chemical products and materials used or capable of being used in the manufacturing of chemical products and gases. The registered office is at No. 13, Arcadian Gardens, Wood Green, N.

Drogheda Gas Manager's Success.—The Drogheda Corporation have adopted the Gas Committee's recommendation for an increase in the remuneration of Mr. H. W. Saville (the Manager), bringing his salary up to £200 per annum. Mr. Byrne said that Mr. Saville was deserving of the increase, as during 1916 he had effected a saving of £200 on coal alone; and Alderman Moore added that the Manager had certainly made the undertaking a success.

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"CRUDE BENZOL PLANTS"
FOR WORKS CARBONISING
"30 TONS OF COAL"
PER DAY, AND UPWARDS.
R. & J. DEMPSTER, Ltd.,
MANCHESTER.

Winding-up an Irish Gas Company.

In the High Court of Ireland, before Mr. Justice Barton, an application was made on behalf of Messrs. Wallace Bros., coal importers, for the appointment of Mr. Klinger as Provisional Liquidator, pending the hearing of a petition for the winding-up of the Gorey (co. Wexford) Gas and Water Company. The application was granted; his Lordship remarking that there was no suggestion that Mr. Joseph Lawton, who was appointed by the Company as Liquidator in the voluntary winding-up proceedings, had not acted correctly. Mr. Lupton, on behalf of Mr. Lawton, said if the reconstruction scheme had been carried through all the debts would have been paid, and there would have been something over.

Public Lighting of Southend.

At the last meeting of the Southend Town Council, the Highways and Works Committee reported that, in accordance with the reference to them from the Council, they had had under consideration the question of terminating the agreement with the Gas Company for street lighting, with a view of substituting electricity for gas in the street-lamps at present connected with the gas-main. The Town Clerk reported that the agreement with the Company covered a period of seven years, expiring on April 1, 1919, but that the Corporation were at liberty to terminate it by three months' notice, expiring on March 31 next, or March 31, 1918, subject to their paying to the Company compensation for the expenses incurred by them at the commencement of the agreement in substituting inverted incandescent burners for the former upright pattern. The amount payable, if the agreement were terminated in March next, would be about £250. The Committee were reminded that the Corporation were at present paying the Company at the rate of £1658 per annum, being the amount chargeable for street lighting under the agreement, less certain allowances, consisting of the value of the gas unconsumed (£2028), an allowance at the rate of 2s. per lamp per annum, in view of the saving effected in gas-mantles (£153), and a further allowance of 1s. 6d. per lamp from the amount of the standing charges (£112). The Committee recommended the Council to terminate the agreement in March next; but, in view of the existing lighting conditions, to defer, for the present, the question of the future arrangements to be made. Mr. Sullivan said the matter was rather sprung on the Highways Committee, and did not receive sufficient discussion. He had since, however, fully considered it. They must remember the Company made them a concession of £2028, which the Council were not legally entitled to. The Company had treated the Council fairly. The Committee's recommendation was negatived by sixteen votes to six.

Coal Crisis in France.—While warning the public that economy in the use of coal, gas, and electricity will be necessary for some time to come, M. Herriot (the French Minister of Supplies) says the worst of the coal crisis is past. A short while ago, a suburban gas company had only two days' supply in hand, and Paris only eight; and electricity companies were in a similar plight. Energetic measures were, however, taken to overcome the first difficulties; and now a number of professional miners are to be recalled from the front. In addition, the miners of the Nord have agreed to work an extra hour daily until the crisis is past. It is hoped in this way, and with the aid of England, to meet requirements.

Summer Time this Year.—Though the Committee appointed by the Home Secretary last September to investigate the social and economic results of the Summer Time Act have not quite completed their inquiry, "The Times" understands that they have already taken sufficient evidence to indicate the general view of the various interests affected by the daylight saving experiment; and this opinion is overwhelmingly in favour of its renewal this year. Though too early to say what changes will likely be made in the arrangements, it is regarded as virtually certain that the scheme will be put into force at a date earlier than May 21. Probably, our contemporary thinks, the Committee will recommend a date between April 1 and May 1. No change will be proposed, it is believed, in the date for the resumption of Greenwich time (Sept. 30).

Gas Consumption in Manchester and Salford.—There has been a great increase in gas consumption in Manchester of late, owing to the fogs; but no record has been established. The consumption in the city last Wednesday was 25,488,000 c.ft., but on Dec. 11 the figures reached were nearly 29,000,000 c.ft. Both amounts are below the highest recorded for one day. In Salford, on Wednesday, the consumption was over 7,000,000 c.ft. The lessened lighting in the streets kept the figures down in all cases. The Gas Committees of both city and borough are, says the "Manchester Guardian," in quoting these statistics, particularly careful in these times not to stop the gas supply of any household whose head is serving his country in the army or navy, even when the account is much overdue. In Manchester—and probably the same might be said of Salford—the authorities have shown their considerateness for poor people by not issuing one summons throughout the year in respect of an unpaid bill.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

The public are informed that newspapers and other printed publications will not be sent to Neutral European Countries unless posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral European Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

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Gas-Workers' Wages at Blackburn.—Mr. W. H. Stoker, K.C., who was appointed Arbitrator to deal with applications by the National Union of Workers for advances to employees at the Blackburn Corporation Gas-Works, has decided that labourers are entitled to double time for work done from 1 p.m. on Saturday to 8 o'clock on Monday morning, instead of time-and-a-half, as contended by the Corporation. He awards them this rate to take effect from May 1 last. A second application was for an advance in wages on account of the increased cost of living. In January, 1914, the men were given an increase of 4d. per shift, equalling 2s. 6d. per week, and in April, 1916, a further increase of 3d. per shift, the latter being the only advance in wages since the commencement of the war. Mr. Stoker awards that, as from Nov. 1 last, the wages of the workers concerned be advanced 8d. per shift in the case of those working shifts of eight hours, and 8½d. per shift for those working shifts of twelve hours—such advances to be regarded as war wages.

STOCK MARKET REPORT.

THE Stock Exchange re-opened on Wednesday after the Christmas Holidays for a brief week of three and a half days. But if it was short it was fairly sweet; for markets almost all round were quite bright and cheerful, and the old year finished up in good style with a happy augury for the début of the new one. Business, indeed, was not very active—a state of things which in some departments proceeded from a paucity of stock.

Among factors of interest, war news and the German peace kite took a secondary place; and the almost one and sole topic of discussion was the new War Loan—what is it to be, and when is it to be? It was generally felt that the issue will not be long delayed now—in fact, some opinions regarded it as imminent; but as to the form it will assume there was much diversity of view. Amid all the schemes and ideas propounded, one thing is certain; and that is that the loan must be made attractive, whether by issue at a discount or being free of income-tax, or being subject to a limited maximum income-tax. In the circumstances, the gilt-edged market last week was very firm with the exception of War Loan, which was shy at first, but recovered before the close.

Home Rails were quiet for lack of sellers, but very firm. The American Market was irregular; dulness rather predominating. The Foreign Market was distinctly firm; the French, Russian, Chinese, and Japanese being prominently in demand. South Africans and Argentines were steadier. In the Miscellaneous group, Rubber and Oil oscillated from time to time, and Shipping, after a favourable turn, had a relapse. A feature was the demand for Bank stocks on the prospect of good accounts for the half year.

Business in the Gas Market left a good deal to be desired in point of quantity; very few issues being dealt in at all. The tone in general, however, was conspicuously firmer. Gas Light ordinary and Imperial Continental made substantial advances on their previous quotations; but the majority of the changes noted were *ex div.* variations on debenture stocks. In the Money Market there was a fair demand; but the supply was ample to meet all requirements, and easy rates ruled. Discount terms were firm.

Bargains done for cash during the week were as follows: On Wednesday, Bombay 5$\frac{1}{16}$, 5$\frac{1}{8}$, Gas Light ordinary 70, 70$\frac{1}{4}$, 71, Ilford "B" 84. On Thursday, Bombay 5, 5$\frac{1}{8}$, British 34$\frac{1}{4}$, 34$\frac{3}{4}$, Gas Light ordinary 70$\frac{1}{4}$, 71, 71$\frac{1}{2}$. Imperial Continental 70$\frac{1}{2}$, 73, 74, 75. On Friday, British 34$\frac{1}{2}$, European 11$\frac{5}{8}$, 11$\frac{3}{4}$, Gas Light ordinary 71$\frac{1}{4}$, 72, ditto maximum 56,56$\frac{1}{4}$, 56$\frac{1}{2}$, Imperial Continental 74, South Metropolitan 79$\frac{1}{2}$, ditto debenture 59$\frac{1}{2}$, South Suburban 80$\frac{1}{2}$. On Saturday, European 11$\frac{1}{4}$, 11$\frac{3}{8}$, 11$\frac{1}{2}$, Gas Light ordinary 71$\frac{1}{2}$, 72$\frac{1}{4}$, South Metropolitan debenture 60.

The Bank rate is 6 per cent.—as fixed on July 13.

William Bradshaw was found dead at a Chadderton mill (where he was employed) with a piece of gas-tubing in his mouth; the other end being attached to a turned-on gas-tap. It was stated that he had worried about his work, which he thought would be too much for him, owing to the shortage of labour.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div on Capital and Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	65—70	..
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	62—64	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	60—65	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅞—6⅛	5—5⅛	5—5⅛
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { 10 p.c.	29—30	25—27	..
333,110	10	,,	7	7/-	B 7 p.c.	15—15½	11—11½	..
115,000	10	,,	6	6/-	Pref. 6 p.c.	13½—14	9½—10	..
159,740	—	—	—	4%	4 p.c. Deb.	..	71—73*	..
992,045	Stk.	Feb. 26	†14	55/-	Brentford A Consolid.	261—266	85—87	..
734,920	,,	,,	†11	53/9	Do. B New	204—209	83—85	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	85—90	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	67—69	..
217,380	,,	Feb. 26	11	10⅔%	Brighton & Hove Orig.	208—213	160—165	..
244,200	,,	,,	8	7⅔%	Do. A Ord. Stk.	154—159	115—120	..
530,000	20	Mar. 26	12½	22/6	British	44—45	34—35	34½—34¾
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	66—68*	..
245,771	,,	,,	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	58—63*	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	1½—1⅞	..
100,000	10	—	—	4⅛%	Do. 4½ p.c. Pref.	4—6	4½—5	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—63*	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	82—83	..
1,513,280	,,	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	103—103	72—74	..
560 000	,,	,,	5⅓	46/8	Do. 3½ p.c. do.	103—105	68—70	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	36—38	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	57—59	..
278,400	—	—	—	11⅛%	Croydon B and C 7 p.c.	..	175—185	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5⅞%	Derby Con. Stk.	123—125	100—105	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	7/6	European, Ltd.	17—18	11—12	11⅛—11⅜
16,313,430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord.	98—102	71—73	71—72½
2,600,000	,,	,,	3½	3⅛%	3½ p.c. max.	76—79	55—58	56—56½
4,062,235	,,	,,	4	4%	4 p.c. Con. Pref.	93—99	69—71	..
4,674 850	,,	June 11	3	3%	3 p.c. Con. Deb.	72½—74½	56—58	..
130,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
258,740	,,	Mar. 12	5	4⅛%	Hastings & St. L. 3½ p.c.	87—89	78—83	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16½	8—9	..
26,600	—	—	—	9⅛%	Hornsey 7 p.c.	..	125—135	..
131,000	Stk.	Mar. 12	7⅛	7⅛%	Ilford A and C	151—154	112—117	..
65,780	,,	,,	6⅜	5⅞%	Do. B	115—118	103—108	8¼
65,560	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	71—74*	..
4,510,000	,,	May 14	9	4½%	Imperial Continental	150—160	72—77	70½—75
1,235,000	,,	Feb. 12	3½	3⅛%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,342	,,	Mar. 12	6⅜	6⅛%	Lea Bridge Ord. 5 p.c.	119—121	87—92	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211—213	85—87	..
					{ B	146—148		
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	74—76	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅜	3⅝—4⅛	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	89—93	..
541,920	20	May 23	4	6/-	Monte Video, Ltd.	11½—12	8¼—8⅜	..
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98½—99½	79—80	..
529,705	,,	June 26	3½	3⅛%	Do. 3½ p.c. Deb.	82—83	75—77	..
55,940	10	Feb. 26	7.14/0	7/8⅔	North Middlesex 7 p.c.	14—15	10½—11½	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	104—106	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7⅛—7⅞	2—3	..
60,000	50	Feb. 26	13	12%	Portsea, Island B	128—131	95—100	..
100,000	50	,,	12	11%	Do. C	118—121	88—93	..
52,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	2—2½	..
199,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4½—5	3—3½	..
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	73—80	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	61—67*	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	8—8½	..
125,000	50	July 1	5	5%	5 p.c. Deb.	47—49	43—45	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	188—192	..
203,984	,,	,,	10	10%	Do. B	222—224	188—192	..
523 500	,,	,,	10	10%	Do. C	220—222	188—190	..
90,000	10	May 28	9	6/-	South African	10½—11½	..	..
6,609,835	Stk.	Feb. 10	5/4/0	44/-	South Met. 4 p.c. Ord.	111—113	79—81	79½
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	59—61	59½—60
221,820	,,	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	145—147	..
952,795	,,	,,	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	80—82	80½
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	79—81	..
135,000	—	—	—	48/4	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—90*	..
647,740	,,	May 14	5	5%	Southampton Ord.	99—102	77—79	..
120,000	,,	Feb. 12	7½	7⅛%	Tottenham District { A 5 p.c.	135—138	120—123	..
782,275	,,	,,	6	5⅝%	B 3½ p.c.	115—117	90—92	..
181,255	,,	June 26	4	4%	4 p.c. Deb.	87—89	65—67	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	103½—109½	91—92	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8⅜	78/9	Wandsworth A 5 p.c.	151—156	117—122	..
215 636	,,	,,	6⅛	63/9	Do. B 3½ p.c.	129—134	101—103	..
108,075	,,	,,	5/17/3	55/1½	Do. C 3½ p.c.	110—115	88—93	..
352,000	,,	,,	6⅛	57/6	Wimbledon 5 p.c.	117—122	90—95	..
98,000	,,	,,	6⅜	63/9	Epsom 5 p.c.	121—126	98—103	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk.	66—69	51—54*	..

* Ex. div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

SHOW ROOM SALESWOMAN. No. 6256.
GAS ENGINEER (Gas Engines and Suction Gas Plants). No. 6253.
GAS-FITTERS. Hereford Gas-Works.
MAIN AND SERVICE LAYER. No. 6260.
SECRETARY AND MANAGER. Calne Gas Company. Applications by Jan. 6.
WORKS FOREMAN. Market Harborough.
WORKING MANAGER AND FITTER. No. 6259.

Agency Wanted (France).

G. Marguerite, 20, Rue de Grammont, Paris.

Plant, &c., for Sale.

AMMONIACAL LIQUOR STILL. Robin Hood Coke Works, near Wakefield.

PURIFIERS, &c., BIRKENHEAD GAS DEPARTMENT. Tenders by Jan. 10.

Plant, &c., Wanted.

GAS-ENGINE AND EXHAUSTER. No. 6258
SULPHATE STILL. No. 6255.

Tank Waggons Wanted (Hire or Purchase).

No. 6251.

Carbon Wanted.

No. 6192.

TENDERS FOR

Tar (Distilled).

BRENTFORD URBAN DISTRICT COUNCIL. Tenders by Jan. 13.